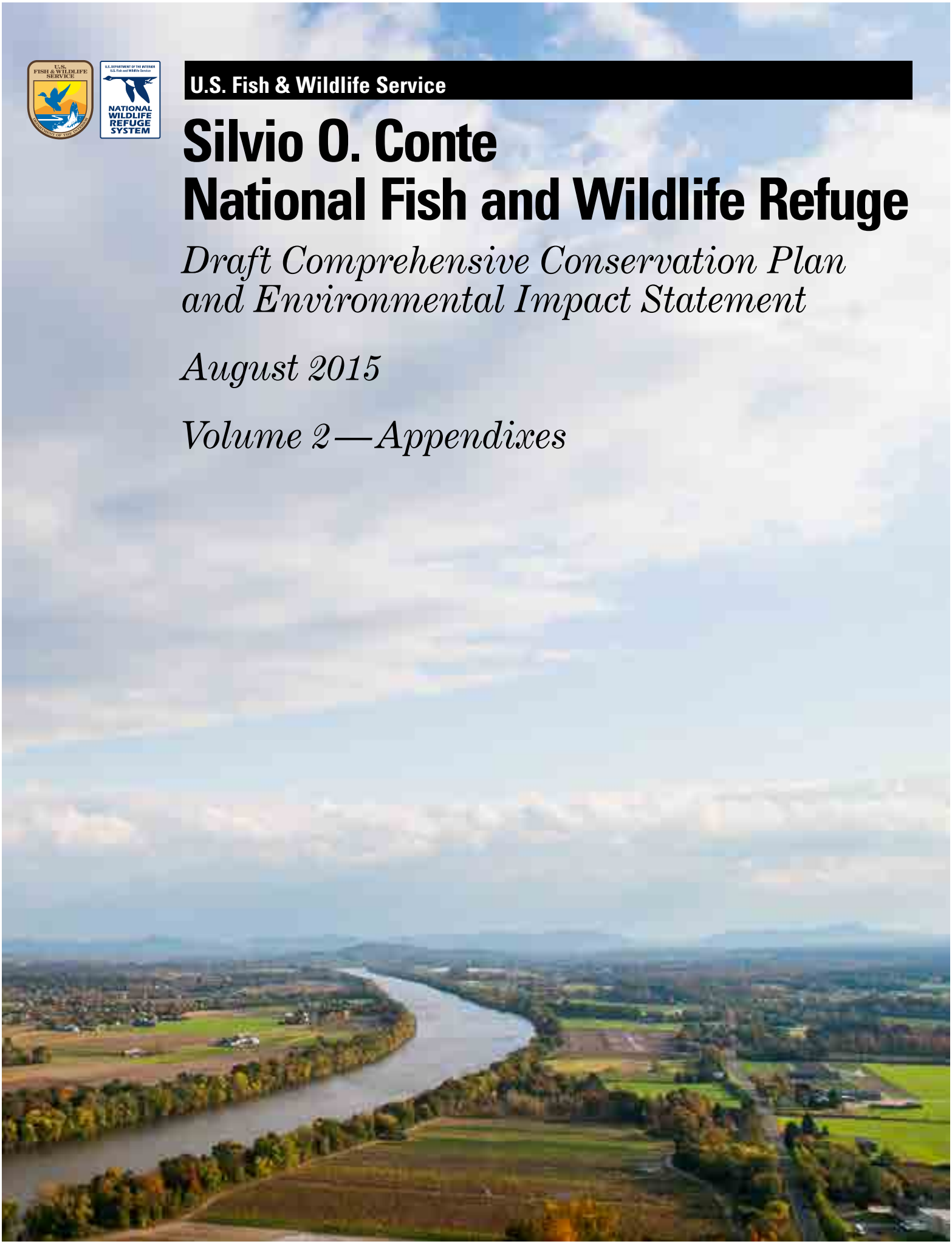
U.S. Fish & Wildlife Service

# Silvio O. Conte National Fish and Wildlife Refuge

*Draft Comprehensive Conservation Plan and Environmental Impact Statement*

*August 2015*

*Volume 2—Appendixes*



*Front cover:*
*Connecticut River from Mount Sugarloaf*
Lamar Gore

*This blue goose, designed by J.N. "Ding" Darling, has become the symbol of the National Wildlife Refuge System.*

The U.S. Fish and Wildlife Service (Service) is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The Service manages the National Wildlife Refuge System comprised of over 150 million acres including over 560 national wildlife refuges and thousands of waterfowl production areas. The Service also operates 70 national fish hatcheries and over 80 ecological services field stations. The agency enforces Federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal Assistance Program which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

Comprehensive Conservation Plans (CCPs) provide long-term guidance for management decisions on a refuge and set forth goals, objectives, and strategies needed to accomplish refuge purposes. CCPs also identify the Service's best estimate of future needs. These plans detail program levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. CCPs do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

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Appendix A

USFWS

*Youth Conservation Corps, at Nulhegan Basin*

# Conservation Focus Areas and Refuge Units—Resources Overview and Management Direction, Including Goals, Objectives, and Strategies


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Paul Erickson

*Fly fishing at Black Branch on the Nulhegan River*

# Introduction

- **Introduction**

# Introduction

This appendix is a companion to chapter 4 of the draft comprehensive conservation plan and environmental impact statement (Draft CCP/EIS) for the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge, refuge). Chapter 4 lists the refuge's watershed-wide goals, objectives, and strategies and describes how we would work with partners throughout the watershed. This appendix takes the watershed-wide goals, objectives, and strategies and steps them down to how we would specifically manage refuge lands over the next 15 years.

## Background Information and Definitions

We describe in detail in chapter 4 of the draft CCP/EIS the distinction between existing refuge divisions and units, and proposed Conservation Partnership Areas (CPAs) and Conservation Focus Areas (CFAs). Our definition of CPAs and CFAs are a construct specifically tied to this draft CCP/EIS only. A summary definition of each term is provided below. Map A.1 shows general locations of where we propose CPAs and CFAs in the watershed. We are proposing that CPAs and CFAs form the geographic framework for implementing strategic habitat conservation under alternatives B, C, and D. Both CPAs and CFAs are proposed in alternatives B, C, and D, although the total number, and/or size of individual areas vary by alternative. This appendix primarily focuses on CFAs included in draft CCP/EIS alternative C (the Service-preferred alternative). Most of the management direction described in this appendix also applies to alternative B, except that we propose to acquire less refuge land in fewer CFAs under alternative B. Table A.1 below lists all of the proposed CFAs and how much land we propose to acquire in each under alternative C. For each CFA, we provide maps showing each the proposed CFAs under alternative C.

Conservation Partnership Areas (CPAs): CPAs are primarily based on one or more subwatersheds using 12-digit hydrologic unit codes (HUCs; USGS). We focus on these areas within the watershed because our State or other conservation partners identified an interest in pursuing conservation activities on these lands and requested Service involvement, coupled with our own assessment that the Service could make an important contribution to conserving Federal trust resources in these areas. In areas we propose as CPAs, the Service would actively facilitate and support conservation, environmental education, and recreation actions, in partnership with others across all ownerships, to contribute toward Conte Refuge's legislated purposes (see chapter 1).

Conservation Focus Areas (CFAs): CFAs are areas nested within CPAs. These are areas where the Service proposes to acquire additional refuge lands due to the concentration and high value of resources important to Federal trust resources. Some CFAs encompass existing refuge lands which will serve as an anchor for additional refuge acquisition, and whose current resource values would be further enhanced by additional acquisition. Specifically, CFAs include lands we feel would be best protected, managed, and conserved by the Service. The CFA boundaries define where the Service would seek authority to pursue a refuge expansion and acquire a fee or easement interest from willing sellers in areas that are not otherwise permanently protected. Each CFA has a discreet and defined boundary that is based on meeting specific conservation objectives (defined further in this appendix), with some refinements to accommodate ownership parcel lines where those adjustments do not diminish achieving our objectives. Once land is acquired for the refuge, we will administratively call the CFA a refuge "division." For example, if we acquire land in the proposed Maromas CFA, we would then call those refuge lands the Maromas Division of Conte Refuge.

The land protection proposal included in the draft CCP/EIS alternative C represents the Service-preferred number, size, and distribution of CPAs and CFAs. Alternative C would result in a refuge expansion of 99,466 acres and a sum total of 197,296 refuge acres. Our recommendations for managing these lands is included in this appendix A, while the design, strategy, and priority for acquiring those lands is further detailed in Appendix C, "Land Protection Plan (LPP)." A summary of the criteria and considerations for defining CFAs is presented below.

***Conserves Priority Conservation Targets.*** We worked with the States and conservation organizations to compile known information on Federal trust resource occurrences and associated important habitat areas. In general, each CFA includes a core biological area that is based on the needs of identified priority resources. In each individual CFA description that follows, we identify the priority refuge resources of concern that would guide future management of those lands under Service ownership.

***Provides Habitat Connections.*** We worked with the States and conservation organizations to insure habitat connections for Federal trust species and other respective state species of concern within the existing and planned conservation landscape. Each of the States and several conservation organizations have identified target or focal areas for additional conservation, and we discussed with them ways to complement their efforts. Collectively, we considered habitat connectivity in area (size), elevation, latitude, aspect, and natural processes (e.g., hydrological flow, groundwater recharge, etc.).

***Incorporates Adaptation Strategies for Predicted Climate and Land Use Changes.*** We also considered in our distribution of CFAs how connections to other existing conserved lands would promote representation, redundancy, and overall resiliency within the watershed, allowing us to be better prepared for changes in land use and climate. We considered North Atlantic LCC modeling results depicting indexes of ecological integrity, and results from The Nature Conservancy resiliency mapping. We considered how our contribution to the conserved lands network could also facilitate near and long term desirable outcomes for species migration and emigration under predicted land use and climate changes. For example, the barrier-free segment near the Connecticut River's mouth creates opportunities, over time, for the landward migration of the coastal wetland complex from the Long Island Sound which can be enhanced through the strategic placement of CFAs in this reach of the river.

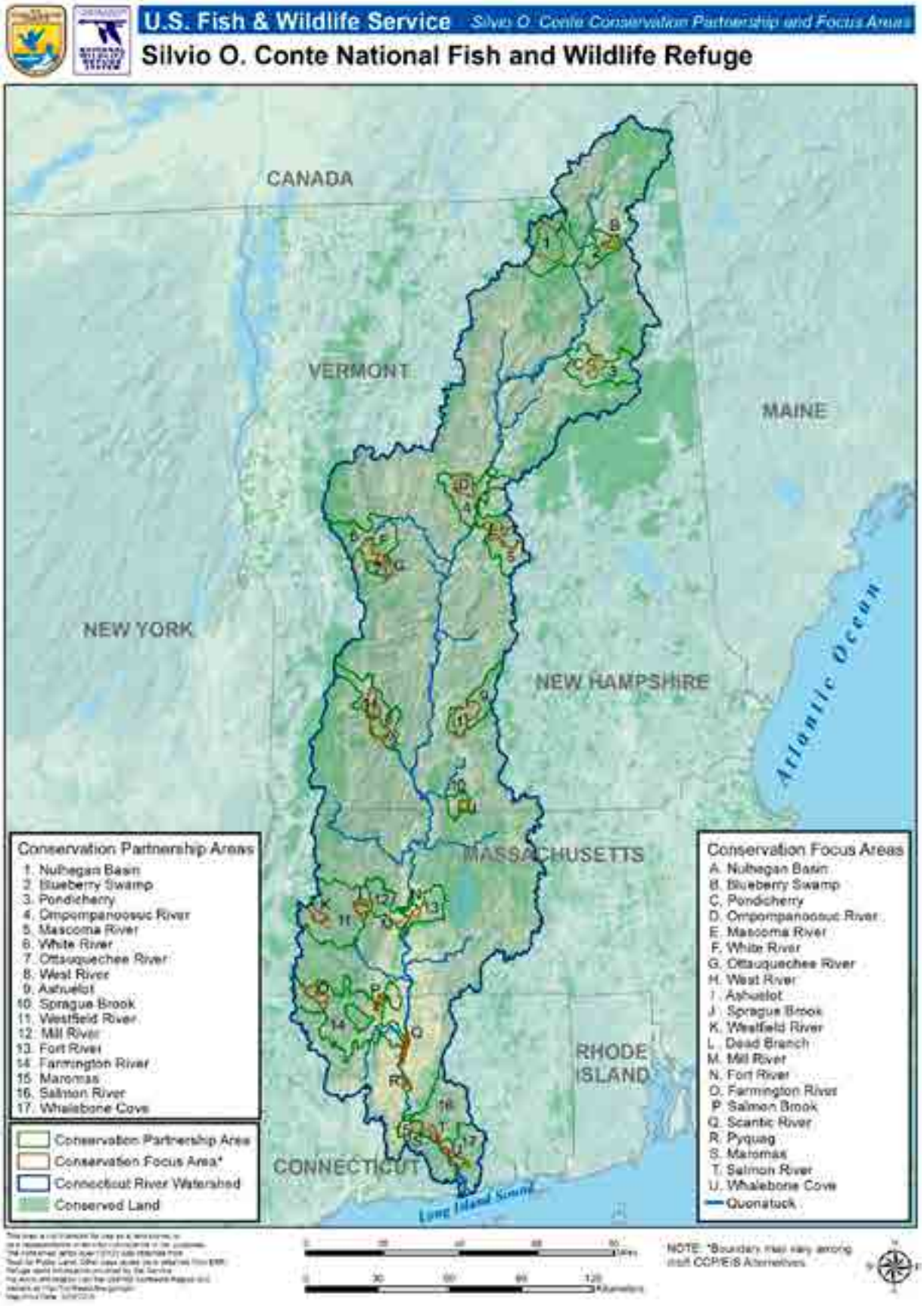
***Incorporates Administrative Efficiencies.*** CFAs are primarily based on the ecological criteria and considerations above; however, the final boundary includes refinements or adjustments to establish a more accessible and operationally efficient "administrative line" that follows prominent features within the landscape that impact access, visibility, and the cost of land stewardship in perpetuity.

In some instances, the exterior administrative line follows transportation corridors, waterways, or other more recognized and predictable configurations. The administrative line is intended to reduce the impact from adjacent uses, promote access and visibility of refuge lands, and conserve operational funding through reductions in maintenance and administrative costs.

Refuge Divisions: Refuge divisions are an administrative subdivision of an existing refuge; they are not stand-alone, official refuges in themselves, although they may have a large enough land base that separate plans and programs are developed. There are currently nine divisions on Conte Refuge. Lands proposed for acquisition in CFAs would either become incorporated into an existing refuge division or a new refuge division would be created once enough land is acquired.

Refuge Units: Refuge units are discreet parcels of existing refuge lands acquired for a specific purpose. There are currently eight units on Conte Refuge; all are small isolated parcels acquired because they were identified as special focus areas in the 1995 Final EIS establishing the refuge.

*Map A.1. Proposed Conservation Partnership Areas and Conservation Focus Areas Under CCP Alternative C*



The primary purpose of this appendix is to explain the importance of existing refuge lands (refuge divisions and units) and proposed refuge lands (CFAs) in meeting the goals and objectives we identified in chapter 1, and to detail how we propose to manage these lands into the future under Service-preferred alternative C. The management direction herein also applies to alternative B, although not all CFAs are included and some are smaller in size under that alternative. In our explanation that follows, we focus on how these lands help conserve Federal trust species and other resources of concern and their habitats (goal 1); how conservation education and outreach could be enhanced (goal 2), the potential for providing compatible, public use opportunities (goal 3), and opportunities to further develop and promote meaningful partnerships (goal 4).

Specifically, we describe the resources of interest and concern for each of the 22 CFAs and eight refuge units in the watershed and detail our proposed management objectives and strategies for these areas. After this introduction, we have organized the body of this appendix into four State sections, one for each of the four States in the watershed. Each State section is further subdivided into a presentation on individual refuge divisions, proposed CFAs, or refuge units. The information we provide for each division, proposed CFA, or refuge unit includes:

- An "overview" sheet with highlights of each area.
- A map of the area, including a delineation of existing refuge lands and conservation lands, as appropriate.
- A map of general habitat types within the larger CPA area.
- A table of acres by general habitat type (tables with more detailed habitat information based on the Northeastern Terrestrial Habitat Classification System are available online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html)*.
- A table of species and habitats of conservation concern for the area, including the priority refuge resources that we propose for refuge management.
- A description of management objectives and strategies we propose under draft CCP/EIS alternative C (Service-preferred alternative). These objectives and strategies are for refuge lands, both existing refuge lands and those that we acquire in the future. This management direction tiers directly to each of the four goals and respective objectives in chapter 3.

We have two exceptions to the organization we describe above. In the Massachusetts section, we also include an overview for the Great Falls Discovery Center which is located in Turners Falls, Massachusetts. The Great Falls Discovery Center is not a CFA or unit, but rather a partnership facility for environmental education and interpretation of the Connecticut River watershed. This overview includes background information, a general locator map, and a description of the management objectives and strategies we propose for the center.

The second exception to our organization is the information we provide on the Quonatuck CFA which spans all four States in the watershed. The Quonatuck CFA includes the lands directly adjacent to the Connecticut River main stem and major river tributaries, although only 8,000 acres would be acquired in this CFA. Because this CFA spans all four states, we present its overview separately at the beginning of the appendix.

## Landscape Perspective

Alternative C and its proposal to expand the refuge to a sum total of 197,296 acres would be an important contribution to the conserved lands network in the 7.2 million-acre watershed. Our proposal focuses on protecting core habitats of significance to Federal trust resources and promoting strategic habitat connections with other conserved lands in collaboration with our partners. Additionally, this proposal builds on the 1995 EIS goals to protect federally listed threatened, endangered, and candidate species; rare or exemplary natural communities; important fisheries habitat; important and vulnerable wetlands; and landbird and waterbird breeding and migratory stopover habitat.

The proposed expansion would contribute to a variety of ecoregional landscape plans and partnership initiatives that include the North Atlantic Landscape Conservation Cooperative (LCC), the North American Waterfowl Management Plan, the Atlantic Coast Joint Venture, the Northern Atlantic Regional Shorebird Plan, the Black Duck Joint Venture Strategic Plan, the Waterbird Conservation Plan for the Mid-Atlantic/New England/

Maritimes Region, the Bird Conservation Region (BCR) 14 and 30 Plans, the Connecticut River Watershed Landscape Conservation Design project, and the four States' respective Wildlife Action Plans. More than 200 species identified as a conservation priority in State Wildlife Action plans would benefit from this proposal.

The LPP (appendix C) provides details on how we identified CFAs, the natural resource values in these areas, and why, in our judgment, those lands would be best protected, managed and conserved in Federal fee ownership or under a Federal conservation easement. The LPP also provides more detailed information on our land protection strategies, including the various options for acquiring and protecting lands from willing sellers by the Service within CFAs. For example, the refuge proposes to seek fee title acquisition of approximately 65 percent of the lands it acquires, and acquire interests via conservation easements on approximately 35 percent. However, the actual percentage will depend on individual landowner preferences.

The following table (A.1) lists all the existing refuge divisions and units and proposed CFAs under the Service's preferred alternative C. We also list the acres proposed under alternative B because much of the management direction in this appendix is also applicable under alternative B.

**Table A.1. Proposed CFAs under Alternatives B and C**

| State | CFA or Refuge Unit Name | Potential Acres in Service ownership under Alternative C: Service-preferred Alternative | *Potential Acres in Service ownership under Alternative B* |
|---|---|---|---|
| ***Proposed CFAs*** | | | |
| CT | Maromas | 3,935 | ***1,941*** |
| CT | Pyquag | 2,956 | ***2,956*** |
| CT | Salmon Brook | 2,770 | **-** |
| CT | Salmon River* | 3,699 | ***2,742*** |
| CT | Scantic River | 4,128 | ***2,136*** |
| CT | Whalebone Cove* | 3,786 | ***1,640*** |
| CT/MA | Farmington River | 8,866 | ***5,411*** |
| MA | Dead Branch* | 6,012 | ***1,336*** |
| MA | Fort River* | 1,662 | ***1,517*** |
| MA | Mill River* | 2,359 | ***1,336*** |
| MA | Westfield River* | 6,520 | ***2,556*** |
| NH | Ashuelot | 17,753 | ***7,152*** |
| NH | Blueberry Swamp* | 4,754 | ***2,114*** |
| NH | Mascoma River | 20,601 | ***9,263*** |
| NH | Pondicherry* | 10,242 | ***6,677*** |
| NH | Sprague Brook | 3,016 | **-** |
| VT | Nulhegan Basin* | 32,541 | ***27,537*** |
| VT | Ompompanoosuc | 15,071 | ***4,464*** |
| VT | Ottauquechee River | 5,985 | **-** |
| VT | West River | 22,020 | ***9,549*** |

| State | CFA or Refuge Unit Name | Potential Acres in Service ownership under Alternative C: Service-preferred Alternative | *Potential Acres in Service ownership under Alternative B* |
|---|---|---|---|
| VT | White River | 10,031 | - |
| CT/MA/NH/VT | Quonatuck (Mainstem) | 8,000 | ***6,000*** |
| ***Existing Refuge Units*** | | | |
| CT | Deadman's Swamp | 31 | ***31*** |
| CT | Roger Tory Peterson | 56 | ***56*** |
| MA | Honeypot Road Wetlands | 21 | ***21*** |
| MA | Mt. Toby | 30 | ***30*** |
| MA | Mt. Tom | 141 | ***141*** |
| MA | Third Island | 4 | ***4*** |
| MA | Wissatinnewag | 21 | ***21*** |
| VT | Putney Mountain | 285 | ***285*** |
| | **Total Acres** | **197,296** | ***96,703*** |

*Proposed CFA includes existing refuge division

USFWS

*Connecticut River from Mount Sugarloaf overlook*

# Connecticut River Main Stem and Major Tributaries

- **Quonatuck Conservation Focus Area (Proposed)**

# Overview
# Quonatuck Conservation Focus Area (Proposed)

## Along the main stem of the Connecticut River and its tributaries in Vermont, New Hampshire, Connecticut, and Massachusetts

| Conservation Focus Area (CFA)—Acreage Profile | Acres |
|---|---|
| Total Acres in CFA* | 8,000 |

*These 8,000 acres are not tied to any specific parcels. The Service does not plan to acquire existing conserved lands along the Connecticut River main stem and will only acquire lands from willing sellers.

## What other special considerations were made in delineating the boundaries of the proposed CFA?

The Quonatuck CFA represents the riparian areas directly adjacent to the main stem of the Connecticut River and the lower reaches of thirteen of its major tributaries (see map A.2 below). The CFA's boundary approximates the 100-year floodplain for the main stem and these thirteen tributaries, as defined by the Federal Emergency Management Agency (FEMA; *http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping#2;* accessed March 2015). Our priority would be conserving floodplain forests and wetlands, as well as tidal (salt, brackish, and freshwater) wetlands. We would seek to protect these habitats were they currently occur, where they can be restored, and/or where they are projected to migrate to in the future due to climate change. We would particularly focus on conserving ownerships that include river frontage. The Quonatuck CFA represents approximately 1,500 acres of tidal marsh and floodplain habitat along the mouth and lower extremities of the river in Connecticut, approximately 1,500 acres of floodplain forest along the river and major tributaries in Massachusetts, and approximately 5,000 acres of floodplain forest along the upper portion of the river and major tributaries and distributed evenly between New Hampshire and Vermont

The 8,000 acres targeted for the Quonatuck CFA is in addition to the acreage identified for the six other CFAs that occur within the 100-year floodplain of the Connecticut River and its major tributaries (map A.2).

## What are the priority habitat types within the proposed CFA?

The priority habitats within the Quonatuck CFA are tidal (salt, brackish, and freshwater) wetlands, floodplain forests, and riparian areas along the main stem of the Connecticut River and its major tributaries.

## What are the resources of conservation concern for the proposed CFA?

1. **Federal Threatened and Endangered Species**
   At least nine federally threatened, endangered, and candidate species occur in the Quonatuck CFA. These include shortnose sturgeon, dwarf wedgemussel, Atlantic sturgeon, Puritan tiger beetle, Jesup's milk-vetch, American eel, piping plover, red knot, and New England cottontail.

   This CFA will contribute to the conservation of the federally endangered dwarf wedgemussel. This species requires stable bank conditions and high water quality (U.S. Fish and Wildlife Service 1993, Nedeau et al. 2000). This mussel is threatened by habitat loss, fragmentation and altered river processes (Nedeau 2009).

   American eel, a species petitioned for Federal listing also occurs in the Connecticut River and tributaries. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit coves, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Shortnose sturgeon and Atlantic sturgeon use habitats in the lower portion of the Connecticut River. Sections of the main stem in Massachusetts are important migrating habitat for shortnose sturgeon, while certain sections in Connecticut are critical spawning and overwintering habitat for this species. Juvenile Atlantic sturgeon were recently documented in the lower portion of the Connecticut River (S. Gephard, CTDEEP, personal communication 2015). This Federal endangered species and a species of greatest conservation need in Connecticut, were once considered extirpated in the Connecticut River, as reproduction no longer occurred in the main stem (Sprankle personal communication 2014). The documentation of juveniles provides a higher probability that there are opportunities to recover this species in the Connecticut River.

The remaining five listed or candidate species occur in habitats directly adjacent to the river and its tributaries. The federally threatened Puritan tiger beetle occur in two populations along the Connecticut River—one in Massachusetts owned by the City of Northampton and Massachusetts Division of Fisheries and Wildlife and another partially occurring on the refuge's Dead Man's Swamp Unit in Connecticut. The Recovery Plan for this species was issued in 1993 (USFWS 1993b). The recovery plan called for a minimum of three metapopulations established or maintained along the species historic range along the Connecticut River. The 2007 5-year review recommended that a high priority be given to identifying private landowners that would be willing to enter into conservation easements for the protection and management of Connecticut River shoreline habitat supporting beetles (USFWS 2007).

The only three known populations of the endangered plant Jesup's milk-vetch occur along the main stem in New Hampshire and Vermont, all in the Quonatuck CFA. The Recovery Plan for this species was issued in 1989 (USFWS 1989b). The protection of the populations was a high priority in the recovery plan. The 5-year review in 2008 stated that the plant continued to experience a high degree of threat and that the three populations along the Connecticut River should be permanently protected by acquisition/conservation easements or through long-term management agreements. The 2009 spotlight action plan specifically highlights land acquisition by the refuge as part of the Service's role and responsibility in the species' protection and recovery (USFWS 2009).

Also, the federally threatened piping plover occurs in one location along a 1-mile sand spit owned by The Nature Conservancy at the mouth of the Connecticut River. Red knot, which is proposed as threatened, also occurs in the same habitats as the piping plovers. The range of the federal candidate New England cottontail includes the Lower Connecticut River watershed and may be found in several locations in the Quonatuck CFA.

**2. Migratory Birds**

The floodplain forest, fresh and tidal wetlands, and riparian habitats along the main stem of the Connecticut River are especially important to migrating birds, such as waterfowl, rails, raptors, and songbirds (Dreyer and Caplis 2001). Species that use these habitats include American black duck, American bittern, snowy egrets, marsh wrens, willow flycatchers, semipalmated sandpiper, and rusty blackbirds.

A study of spring stopover habitat use by Neotropical migrant birds within the Connecticut River Valley (*http://www.science.smith.edu/stopoverbirds/index.html;* accessed March 2015) conducted by Smith College through funding by the Service provides indications of the importance of the Connecticut River watershed to migrating birds. During a 3-year study (1996 to 1998), observers conducted 8,640 point count surveys and counted a total of 102,259 birds. The results demonstrated that spring migrant birds using the Eastern Flyway reach the southern portions of the Connecticut River watershed in large numbers, then disperse throughout the watershed and beyond as they continue north. Almost half (47 percent) of the birds counted within the defined count circles were at sites along the main stem of the Connecticut River. This trend was even more pronounced along the Connecticut and Massachusetts portions of the river and during the early periods of spring migration. Forested wetlands and shrub swamps are likely to be particularly valuable habitats along the main stem of the river because they provide more food and protection earlier in the spring migratory period due to warmer air and water temperatures and earlier tree leaf-out. Overall density of birds observed decreased by about half from south to north, as birds dispersed away from the main stem of the river as they moved north. The mouth and lower main stem of the Connecticut River may serve as a landscape feature used by many Eastern Flyway migrants to orient north after reaching the southern New England coast. The results of this study suggest that habitat protection within the Connecticut River watershed will have significant benefits for supporting neotropical migrants during the spring migratory period, especially forest and shrub wetlands along the southern third of the main stem.

3. **Waterfowl**
   The lower Connecticut River has abundant waterfowl year-round and has some of the highest and most significant concentrations of black duck in the Northeastern United States (Dreyer and Caplis 2001). The freshwater and tidal wetlands along the Connecticut River, particularly in the lower portion of the watershed, provide important stopover habitat during both spring and fall migrations for waterfowl, such as American black duck. The habitats most important to black duck are the tidal wetlands along the main stem, as well as the tidal wetlands and bays along the coast. In the winter, the river provides relatively ice-free open water habitat providing access to submerged aquatic vegetation, invertebrates and high-calorie wetland vegetation. Many waterfowl also nest along the river, including mallards, black duck, Canada goose, green-winged teal, and gadwall.

   Further north in the watershed, many migrating ducks use flooded agricultural fields, floodplains, emergent wetlands, shrub swamps, and backwater areas along the Connecticut River for stopover habitat. In fact, the Connecticut River is a waterfowl focus area under the Atlantic Coast Joint Venture for New Hampshire and Vermont, highlighting the importance of the river habitats to breeding and migrating waterfowl (ACJV 2005, NHFG 2006). Species such as Canada geese, teals, mergansers, American black ducks, mallards, wood duck, and some sea ducks use the river corridor during spring and fall migration. The river provides prime breeding habitat for American black duck, wood duck, mallard, common merganser, and Canada geese. Other species nest along the river, but are less common.

4. **Diadromous fish and other aquatic species**
   In addition to the aquatic species mentioned above under "Federal Threatened and Endangered Species," the Connecticut River is home to a variety of anadromous fish and other aquatic species including alewife, blueback herring, Atlantic salmon, Atlantic sturgeon, and American shad. Brook trout are also present, but use cold water tributaries and are more common in the northern portion of the watershed. This high number of priority aquatic species is an indication of the diversity of habitats provided by the Connecticut River and its extensive tributaries. One of the major threats to these species is the large number of dams along the Connecticut River and its tributaries, which are obstacles to migratory fish and other aquatic species passage.

5. **Wetlands**
   There is a large diversity of important wetlands along the Connecticut River main stem and its tributaries. These include floodplain and riparian forests that improve water quality for plants, fish, wildlife, and a very large urban and suburban human population. These riparian wetlands are also important for absorbing impacts from increasingly more frequent storm events where coastal and inland flooding can negatively impact habitats and human infrastructure. The protection and restoration of these habitats is critical to becoming more resilient to climate change.

   Other wetlands of significance include the tidal wetlands complex in southern Connecticut which was designated "Wetland of International Importance" by the Ramsar Convention. The Ramsar designation is used for wetland complexes that have international significance in terms of ecology, botany, zoology, limnology, or hydrology. The Connecticut River designated area contains 20,570 acres and consists of 20 discreet major wetland complexes. The lower tidal wetlands complex is considered the best example of this type anywhere in the Northeastern United States and is the most pristine large river marsh system in the Northeast.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

Our major habitat management would be habitat restoration and conservation, particularly restoring and maintaining floodplain forest, tidal wetlands, and forested buffers along the river and its tributaries.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would seek to provide recreational access to the river for priority public uses (hunting, fishing, wildlife observation and photography, interpretation, and environmental education) consistent with the applicable final compatibility determinations.

## Does the proposed CFA have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

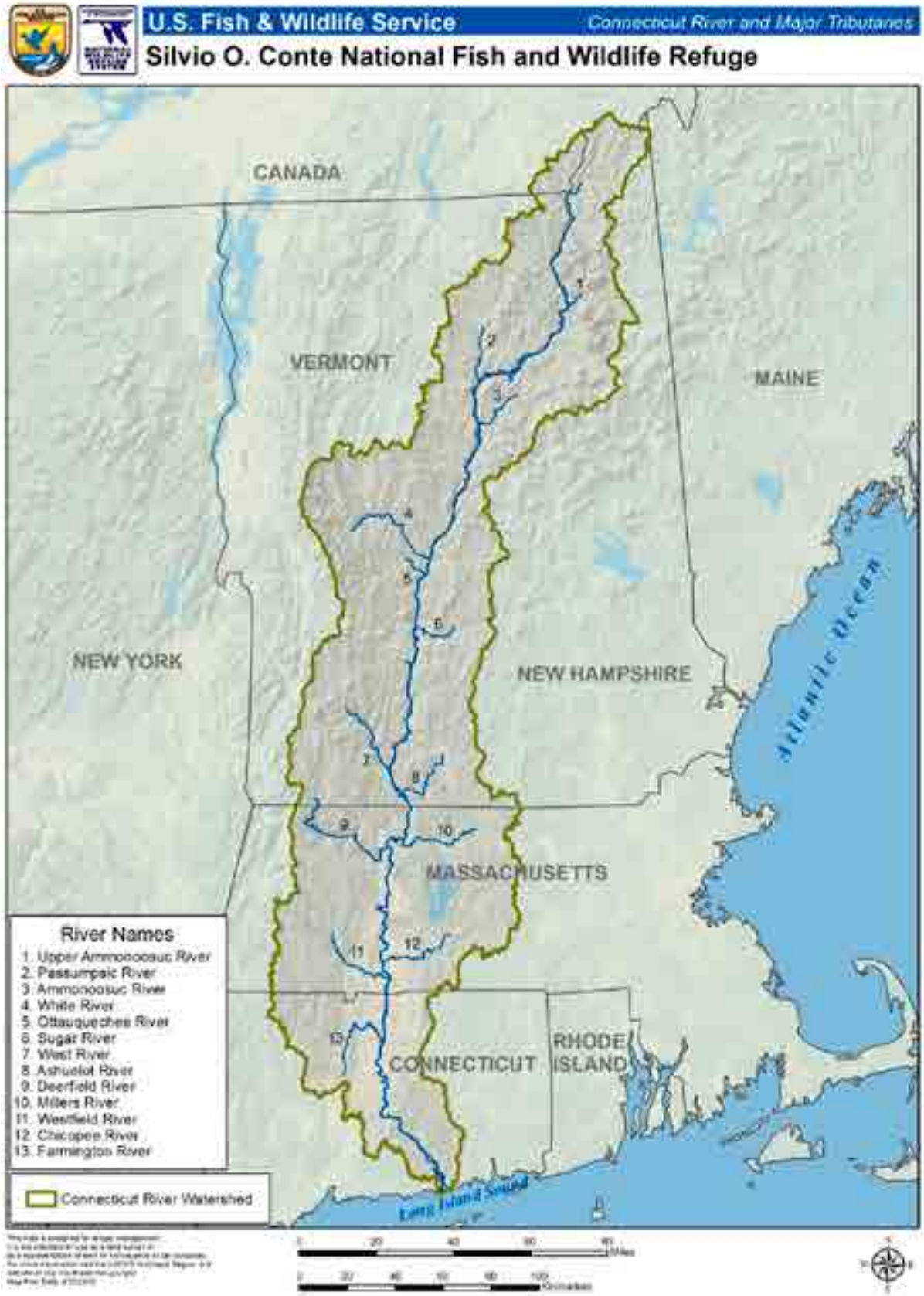
In addition to the Ramsar designation mentioned above, the Connecticut River is designated as National Blueway and an American Heritage River. There are also at least five Important Bird Areas (IBAs) in the Connecticut River watershed: Lower Connecticut River Valley IBA, Station 43 IBA, Herrick's Cove IBA, Barton's Cove—Poet's Seat IBA, and Longmeadow Flats IBA.

## How would increased land protection within this CFA help the Service and other conservation landowners adapt and respond to climate change? For example, do these lands significantly contribute to representation, resiliency, and connectivity across the watershed?

The Connecticut River is a free-flowing river for its entire extent in the State of Connecticut. The first dam on the main stem is located in Holyoke, Massachusetts. Its head of tide, the point within the river system where the daily flushing of the tides does not affect the level, is located near Hartford, Connecticut. The barrier-free segment of the river in the State of Connecticut creates opportunities for the emigration of the coastal wetland complex from the Long Island Sound. This CFA is strategically placed to allow that migration to occur. Tidal salt, brackish, and freshwater wetlands along with other floodplain wetlands and forests will be a priority for protection within this CFA. As the sea level changes, the tidally influenced coastal wetland complex will have room to move inland, given suitable soils slopes and other factors.

A major goal is to work with the rest of the conservation community to promote, maintain, and/or enhance both terrestrial and aquatic ecosystems connectivity. Critical connections exist not only between aquatic systems, but also between the Connecticut River uplands, lowlands and floodplain. This CFA facilitates that connectivity and provides more flexibility to adapt to land use and climate change. Strategically protecting land within this CFA could promote near- and long-term opportunities for adaptation, such as corridors for species' migration.

*Map A.2. The Quonatuck CFA (100-year Floodplain)*



# Goals, Objectives, and Strategies for Refuge Lands in the Quonatuck CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide stopover habitat for migrating landbirds, nesting trees for osprey and bald eagle and early successional habitat for New England cottontail.

***Rationale:***
We envision healthy forests within the Quonatuck CFA where a diverse seral structure provides suitable habitat conditions for a suite of wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010). This sub-objective assumes the forests of the Quonatuck are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Foster et al. 1998; Foster 2000; Goodburn and Lorimer 1998; Cogbill 2002; Bellemare et al. 2002; Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and where appropriate, move succession forward to emulate later seral stage characteristics.

For many species, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Quonatuck will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. The USFWS New England cottontail initiative has identified focus areas along the lower Connecticut River, where the decline in early successional habitats is a particular problem for the New England cottontail. New England cottontail is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut and Massachusetts.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of fifteen or more habitat patches, several of which are 25 acres or more. Each habitat patch being one mile or less from each other to aid in New England cottontail movement between patches (Fuller et al 2012). Early successional management within the Quonatuck CFA will occur adjacent to existing acceptable habitat patches to benefit New England cottontail.

Migrating landbirds are typically unable to deposit sufficient fat stores to fly nonstop between breeding and nonbreeding areas (Blem 1980) and must use stopover habitats for feeding and resting before continuing migration. Studies have shown migrating birds exhibit selective use of some habitats over others (Petit 2000; Moore et al. 1990; Rodewald et al. 2004). In general, taller, more structurally diverse vegetation types within an area appear to support greater numbers of migrating birds than do habitats of lower stature and complexity (Noss 1991; Moore et al. 1990). Clearly, structurally complex habitats will not be suitable for all migratory species, but our conservation goal is to provide those areas used most frequently by migrating birds, suggesting relatively

tall, structurally diverse habitats may best serve this purpose. The plasticity in habitat use exhibited by most species during migration (Moore et al. 1990; Petit 2000) suggests that many species are able to effectively use the food resources and cover afforded by structurally complex habitats. Our management goals for hardwood forests in this division would be to provide a diversity of age classes supporting a variety of bird species with a range of foraging opportunities. Patches of mature edge-dominated and shrub-sapling stage forests were used most frequently by fall stopover migrants in a Pennsylvania study (Rodewald et al 2004).

In a mature forest, many migrating bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. In order to support the foraging needs of the greatest diversity of bird species, hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral shrub-sapling habitat rich in fruits and insects important to migrating birds (Noss 1991; DeGraaf et al. 2006).

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater than dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the sharp-shinned hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near open bodies of water, are utilized by bald eagles and osprey. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, barred owls, and woodpeckers, like the northern flicker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan (HMP).

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure.
- Work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. Plan to manage approximately 100 acres of shrubland habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a HMP is completed.
- Work with partners, including the states in support of the state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Map vernal pools and seeps.
- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1b. (Hardwood Swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
Occurrences of hardwood swamps within the Quonatuck Conservation Focus Area (CFA) represent a number of natural communities. Historically they have undergone significant alteration, and have great potential for restoration. Acidic hardwood swamps may be found in basins, or on gently sloping seepage lowlands within small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Eastern hemlock is often the dominant overstory species, and the organic substrate supports an important sphagnum (moss) layer.

Hardwood swamp occurrences within the Quonatuck CFA with more alkaline soils are often found along riparian and floodplain areas in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the water table drives complexes of forest upland and wetland species including pin oak, red maple, swamp white oak, sweetgum, and blackgum.

These two systems do share a common disturbance history; agricultural practices, development pressures, and selective logging have largely removed these habitats from the landscape, or greatly simplified their historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats. Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within the Quonatuck will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions.

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for spring and fall migrant birds in a landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites shown to be important during the energy-intensive migration (Petit 2000).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the four state's wildlife agencies in support of their respective state wildlife action plan, to ensure management on Service lands complements adjacent land management objectives.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve forest structure, species composition, and/or ecological function.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, improve landscape connectivity to aid in climate change adaptation and provide habitat for migrating landbirds and migrating, breeding, and wintering waterfowl.

***Rationale:***
Shrub swamps and floodplain forests are often found within the floodplain of rivers and streams. Though, shrub swamps also occur in isolated pockets within poorly drained areas and small seepage zones that are not part of a floodplain system (Gawler 2008). Many shrub-dominated swamp communities are maintained through flooding, and will likely persist for centuries. Floodplain forests occur within the floodplains of major river systems, including the Connecticut River and many of its tributaries. These forests were a common occurrence until the middle of the 1800s, when floodplain communities were converted to agricultural use or urban areas. Floodplains are still valuable for agriculture today, and only fragments of floodplain forest remain within the watershed (Marks et al. 2011, Thompson and Sorenson 2000).

Shrub swamp and floodplain forest communities provide important habitat for migratory landbirds. A study of spring stopover habitat use by neotropical migrant birds within the Connecticut River Valley (*http://www.science.smith.edu/stopoverbirds/index.html*; accessed August 2013) conducted by Smith College through funding by the Service provides indications of the importance of the Connecticut River watershed to migrating birds. During a 3-year study (1996 to 1998), observers conducted 8,640 point count surveys and counted a total of 102,259 birds. The results demonstrated that spring migrant birds using the Eastern Flyway reach the southern portions of the Connecticut River watershed in large numbers, then disperse throughout the watershed and beyond as they continue north. Almost half (47%) of the birds counted within the defined count circles were at sites along the main stem of the Connecticut River. This trend was even more pronounced along the Connecticut and Massachusetts portions of the river and during the early periods of spring migration. Forested wetlands and shrub swamps are likely to be particularly valuable habitats along the main stem of the river because they provide more food and protection earlier in the spring migratory period due to warmer air and water temperatures and earlier tree leaf-out. Overall density of birds observed decreased by about half from south to north, as birds dispersed away from the main stem of the river as they moved north. The mouth and lower main stem of the Connecticut River may serve as a landscape feature used by many Eastern Flyway migrants to orient north after reaching the southern New England coast. The results of this study suggest that habitat protection within the Connecticut River watershed will have significant benefits for supporting neotropical migrants during the spring migratory period, especially forest and shrub wetlands along the main stem of the river.

The shrub swamp and floodplain forest communities along the Connecticut River also provide stopover and breeding habitat for migrating and breeding waterfowl. The Connecticut River is a waterfowl focus area for New Hampshire and Vermont under the Atlantic Coast Joint Venture, highlighting the importance of the river habitats to breeding and migrating waterfowl (ACJV 2005, NHFG 2006). Species such as Canada geese, teal, mergansers, American black ducks, mallards, wood duck, and some sea ducks use the river corridor during spring and fall migration. The river provides prime breeding habitat for American black duck, wood duck, mallard, common merganser, and Canada geese. The lower Connecticut River supports waterfowl year-round with some of the highest and most significant concentrations of American black duck, a priority refuge resource of concern species, in the Northeastern United States (Dreyer and Caplis 2001).

Floodplains are not only important to species of conservation concern, but also to provide resilience to climate change. Storms are predicted to become more frequent and capable of producing more coastal and inland flooding. These storms are, and can continue to, negatively impact habitats and human infrastructure. Intact and connected floodplain habitats will slow down and contain floodwaters decreasing damage to watershed ecosystems and human infrastructure. It is critical that these habitats are protected and restored throughout the watershed.

Due to our unfamiliarity with habitat conditions in the CFA, management of these wetland communities will first require a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA. Baseline information on the condition of these wetlands at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners to restore degraded habitats, particularly floodplain forests.
- Work with partners, including the four state's wildlife agencies in support of their state wildlife action. plans, to ensure management on Service lands complement adjacent land management objectives.
- Control invasive plant species following best management practices. Invasive plant priorities include:
  - ✓ Removing invasive Oriental bittersweet using a combination of pulling smaller plants, cutting larger stems, and treating with herbicides to protect valuable canopy trees and young floodplain forest trees.
  - ✓ Removing black locust using herbicides following best management practices (*http://mnfi.anr.msu.edu/invasive-species/BlackLocustBCP.pdf*) to protect floodplain forest.
  - ✓ Control Amur corktree and other new, small infestations of invasive plants able to withstand flooding.
- Work with local Conservation Commissions on preferred herbicide use measures and ensure our invasive plant control complies with state wetlands protection acts.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marsh communities to support natural and rare ecological communities, and provide breeding, wintering, and stopover habitat for waterfowl.

***Rationale:***
Freshwater marshes along the Connecticut River are often part of the floodplain community, though they also occur in isolated pockets within poorly drained areas and small seepage zones outside the floodplain system. These habitats provide important stopover and breeding habitat for waterfowl and waterbirds. The Connecticut River is a waterfowl focus area for New Hampshire and Vermont under the Atlantic Coast Joint Venture, highlighting the importance of the river habitats to breeding and migrating waterfowl (ACJV 2005, NHFG 2006). Species such as Canada geese, teal, mergansers, American black ducks, mallards, wood duck, and some sea ducks use the river corridor during spring and fall migration. The river provides prime breeding habitat for American black duck, wood duck, mallard, common merganser, and Canada geese. Freshwater marshes provide calorie-rich aquatic and emergent vegetation, and invertebrates for these waterfowl species. Rails, bitterns, egrets, and herons also use freshwater marsh habitats for breeding and stopover foraging opportunities. Shorebirds will use tidal mudflats of freshwater tidal wetlands for foraging in the southern portion of the watershed.

These communities are identified as having high ecological and functional importance within the state wildlife action plans. Also within these plans, a common concern exists for the health and proliferation of these habitats. Development, invasive species, contamination, altered hydrology, dredging, and sedimentation are a few of the threats that are damaging these ecosystems.

Due to our unfamiliarity with habitat conditions in the CFA, management of these wetland communities will first require a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA. Baseline information on the condition of these wetlands at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Use state best management practices within or adjacent to active agricultural fields that are located along the perimeter of marsh habitats.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife use of existing wetlands.
- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Where appropriate, restore pasture, hay, and grasslands to floodplain forest communities and provide a forested buffer along the Connecticut River. Also, if and where appropriate, maintain a contiguous block of grassland habitat for breeding and migrating grassland bird species.

***Rationale:***
These habitat types are primarily the result of agricultural production activities. Agricultural lands occupy roughly 8.5 to 12 percent of the watershed's landbase, of which one-half to one-third, approximately 229,000 acres, is prime agricultural land. Most of the quality agricultural lands are in the broad Connecticut River Valley (Clay et al. 2006) and often within the floodplain of the Connecticut River.

Floodplain forests occur along medium to large rivers, and include a matrix of upland and wetland habitats. Common habitats in floodplains are silver maple stands, herbaceous sloughs, and shrub wetlands. Most areas are underwater each spring; micro-topography determines how long the various habitats are inundated. Associated trees include red maple and American hornbeam and on terraces or in more calcium rich areas, sugar maple or red oak may be locally prominent, with yellow birch and ash, black willow is characteristic of the levees adjacent to the channel. Common shrubs include silky dogwood and viburnum. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern-dominated understory in many areas by mid-summer (Gawler 2008). Within the Connecticut River watershed, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions and soil compaction remain as threats.

Our conservation efforts within the Quonatuck CFA will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Intact floodplain forests in the Quonatuck CFA will provide high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Species such as wood thrush, veery, and black-throated green warbler with a preference for forest habitats during migration will benefit (McCann et al. 1993). Restoration of floodplain forest communities will restore forest connectivity, providing travel corridors for wildlife. Increased water quality will also result as erosion and siltation will decrease, and a restored canopy will provide shade for aquatic species.

During European settlement millions of hectares of forests were cleared for agriculture in the eastern U.S. creating habitat for grassland dependent birds. As agricultural activities declined, open areas dominated by herbaceous vegetation began to convert back to forests, causing a drastic decline in grassland species in the region. Prior to European settlement, Native Americans also cleared and maintain some amount of grassland habitat. Naturally occurring grassland ecosystems were not uncommon in the eastern U.S., but, were often found closer to the coast rather than inland (Brennan et al. 2005). These grassland ecosystems have since been impacted by development and fragmentation.

The major river valleys and coastal areas likely contained most of the natural grasslands (Dettmers and Rosenberg 2000). Today, little historic natural grassland remains. Potentially suitable lands, such as pastures and hayfields, are increasingly being converted into residential developments. The highest quality habitats for grassland birds in the Watershed typically are in conservation areas or airports which delay mowing until the middle of July to allow the ground-nesting birds to fledge their young.

Some level of grassland conservation and, where appropriate, restoration, is warranted based on the historic evidence and the desirability of retaining grassland species (often state-listed) in each state. The Partners in Flight plan for the Southern New England Physiographic region set a broad level goal of protecting 25,000 to 38,000 acres of grassland, to produce 250 breeding pairs of upland sandpipers, 800 pairs of grasshopper sparrows, and 15,000 pairs of bobolinks. In Connecticut, Connecticut Audubon recommended a 5,000-acre network of natural grasslands in patches at least 500 acres in size, 3,500 acre late harvest working hayfields (greater than 25 acre blocks), and giving priority to currently existing grasslands (Comins et al. 2005).

Due to our unfamiliarity with the habitat conditions in the CFA, a comprehensive, multi-scale habitat and wildlife inventory will be necessary to implement refuge strategies. This inventory will need to encompass all habitats within the CFA and associated landscape. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Assess the condition of pasture, hay and grassland habitats, as well as the overall size and location in the CFA, and proximity to other forest openings, to inform more detailed management strategies in an HMP.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Quonatuck CFA and Connecticut River to benefit priority refuge resources of concern including American shad, shortnose sturgeon, American eel, alewife, blueback herring, and Atlantic salmon.

***Rationale:***
The Connecticut River provides important habitat for American shad, shortnose sturgeon, American eel, alewife, and blueback herring. The major tributaries of the river also provide additional open water habitat for these species. There are also various brooks that feed into these rivers that are important for river herring, which require fast moving, shallow water for spawning. American shad, shortnose sturgeon (a federally listed species), American eel, and alewife spawn in slow moving waters of larger tributaries such as the Connecticut River. The Connecticut River is also important for migratory Atlantic salmon that spawn in cold water habitats further north.

Restoring and maintaining the ecological integrity of upland and wetland habitats of the CFA will have positive impacts on water quality of the Connecticut River, and other aquatic systems in the CFA. Baseline information on the condition of the water resources, and associated upland and wetland habitats in the CFA will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to maintain open channels from the Connecticut River to open water coves.
- Work with adjacent landowners to eliminate barriers to aquatic species passage.

*Within 10 years of land acquisition and CCP approval:*

- Work with partners to protect and increase "hard bottom" (e.g., gravel, cobble, or bedrock) for spawning aquatic species.
- Work with partners to reduce combined sewer overflow.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

**Sub-objective 1.4a. (Dunes and Maritime Grasslands)**
Protect and manage dunes and maritime grassland habitats to support species of conservation concern and natural and rare ecological communities.

***Rationale:***
These habitats include the Atlantic coastal plain northern dune and maritime grassland, and heathland and grassland community types. These systems are restricted to the coast of Connecticut, and are therefore rare in the watershed. Coastal dunes and grasslands are generally small, in good to fair condition, and often located along Long Island Sound adjacent to low energy beaches (CT 2005). The grasses and shrubs that dominate are influenced by the maritime environment, including frequent salt spray, saltwater overwash, and sand movement (Gawler 2008).

The coastal plain heathland and grassland communities are related to dune grasslands but occur on sandplains, not dunes. These communities may occur as heathlands, grasslands, or support a patchwork of grass and shrub vegetation. Sandplain grasslands are one of the most impacted terrestrial habitats in Connecticut, and the condition of the habitat is considered poor (CT 2005). Coastal plain heathland and grassland community vegetation is maintained by fire, though in the absence of disturbance (fire, grazing, mowing), coverage by pitch pine and scrub oak can increase, creating vegetation similar to a pitch pine—scrub oak barren; or in some cases, a tall-shrub community can develop in the absence of fire (Gawler 2008).

These communities are fragile habitats that support priority species in need of protection from human development and disturbances. They protect salt marsh from storms and provide nesting and feeding habitat for piping plovers, least terns, and American oystercatchers. The most challenging issues facing dune habitat are recreational activities, oil spills, and rising sea level resulting from climate change (CT 2005).

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including state wildlife agencies, in support of state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives
- Work with partners to monitor and protect breeding populations of colonial and beach nesting birds such as piping plover and least terns.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.4b. (Biological Integrity, Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the watershed.

***Rationale:***
Refuge managers are required to manage for the "biological integrity, diversity, and environmental health" (BIDEH) of the Refuge System pursuant to the National Wildlife Refuge System Improvement Act of 1997. This mandate is a cornerstone of Refuge System philosophy and management. The framework for fulfilling the mandate is provided in Refuge System Policy 601 FW 3, which calls for the maintenance of "historic conditions," which are defined in policy as "composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related

changes to the landscape." In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010).

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987; Hunter 1991; Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and slow moving streams and pools in wetland ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer & Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Quonatuck CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger upland and wetland matrix, and providing additional structural and species diversity to the matrix. Rocky shorelines along large river systems, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or a nutrient rich site for benthic organisms. One could make the case that these rocky shorelines are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including state wildlife agencies, in support of the state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

**Sub-objective 1.5a. (Salt Marsh)**
Protect and manage salt marsh habitats to support species of conservation concern, and natural and rare ecological communities.

***Rationale:***
The name Connecticut is the French corruption of the Algonquin word "quinetucket" meaning *long tidal river*. The second largest group of wetlands in the Watershed is estuarine wetlands or tidal wetlands which are located in the lower part of the main stem of the Connecticut River. Estuarine wetlands are influenced by both tidal and freshwater flows. The lower part of the Connecticut River is considered the most pristine large–river tidal marsh system in the Northeast (USFWS 1994). The wetlands at the mouth of the Connecticut River are intertidal marshes vegetated by grasses such as smooth cordgrass, saltmeadow cordgrass or hay grass, salt or spike grass, saltmeadow rush or black grass, and other salt–tolerant plants. Salt marshes are among the most productive ecosystems in the world.

Further upstream, the Connecticut River has extensive, high-quality freshwater and brackish tidal wetland systems which provide habitat for several federally listed species, species at risk and globally rare species, including wintering bald eagles, shortnose sturgeon, and Puritan tiger beetles. This area also provides significant American black duck habitat for breeding, wintering, and migration. It serves as an important movement corridor for migratory birds, especially waterfowl, rails, many species of neotropical migrants, and raptors. Within this group of wetlands, wild rice marshes are considered rare and valuable and function as significant resting and feeding areas for waterfowl, shorebirds, and especially the sora rail.

The lower Connecticut River tidal wetlands complex has been designated a "Wetland of International Importance" by the multi-national Convention on Wetlands of International Importance (aka Ramsar Convention). The Ramsar Project area contains 20,570 acres and consists of 20 discrete major wetland complexes (USFWS 1994). The Ramsar designation is used for wetland complexes that have international significance in terms of ecology, botany, zoology, limnology, or hydrology. The lower Connecticut River tidal wetlands complex is considered the best example of this type in the northeastern United States.

Tidal wetlands provide foraging habitat for a variety of shorebirds, including willet, various species of sandpipers, ruddy turnstone, red knot, and whimbrel. These wetlands also support migrating and wintering waterfowl, various marsh birds, sparrows, bald eagles, and osprey. Its tidal marshes and mudflats support significant concentrations of waterfowl and shorebirds, as well as nesting habitat for global significant species such as the salt marsh sharp-tailed sparrow (Atlantic Coast Joint Venture 2005). This habitat is also important as nursery areas for a variety of aquatic species.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including state wildlife agencies in support of the state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.
- Identify and prioritize wetland restoration or enhancement projects that benefit species of conservation concern.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories particularly to determine the status, abundance, and distribution of priority resources of concern such as salt marsh sharp-tailed sparrows, and American black duck.
- Map natural communities; protect rare or exemplary examples.
- Identify and map estuarine habitats, particularly spawning and nursery habitats.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to: develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively towards solutions; model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Quonatuck Division as an outdoor classroom.

***Rationale:***
Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to "provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access."

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Quonatuck Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Quonatuck Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Quonatuck Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Quonatuck Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
Interpretation is an important tool that can be used to spread the refuge message to private residents and visitors to the refuge. With an ADA-compliant trail planned for the site, the Quonatuck Division is well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge, and the Quonatuck Division's habitats, wildlife, and cultural resources.

**Management Strategies:**
*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Quonatuck Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, print and social media, signs, and exhibits) when creating programming for natural and cultural resource interpretation.
- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members and the general public, with priority given to refuge affiliates.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Quonatuck Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge Web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures (e.g., general brochure and bird checklist) that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self-guided interpretive messages and use state-of-the-art, as well as traditional media (e.g., pamphlets, signs, etc.).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Quonatuck Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Quonatuck Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
Hunting is one of the six priority, wildlife-dependent recreational uses for the Refuge System. Hunting is generally allowed on national wildlife refuges, as long as it is found to be a compatible use. We would plan to open portions of the Quonatuck Division to hunting, assuming it is found compatible and we acquire sufficient land to support hunting. Allowing hunting opportunities at this unit conforms to historic use on the nearby state wildlife management areas. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the states' population management objectives.

**Management Strategies:**
*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Consult with state wildlife agencies to evaluate the suitability of new acquisitions to support a safe, manageable hunt programs.
- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours, as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with state wildlife agencies to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with state wildlife agencies to evaluate the effectiveness and success of a refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes to access the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, Web site pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce hunt brochure(s) that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Quonatuck Division kiosks, through a friends group, and in local businesses.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with state wildlife agencies to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Quonatuck Division after completing all administrative procedures to officially open refuge lands to fishing, based on state regulations and division-specific regulations, if necessary.

***Rationale:***
Fishing is one of the six priority, wildlife-dependent recreational uses for the Refuge System. The principal fishing resources on this CFA are the Connecticut River and its major tributaries. Our management would focus on providing river access to anglers, where compatible fishing opportunities exist.

**Management Strategies:**
*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.

*Within 5 years of acquiring land with fishable waters:*
- Work with state wildlife agencies to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired and fishing is determined to be compatible, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
*Within 1 year of acquiring land with fishable waters:*
- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at the division kiosk, through friends groups, and in local businesses.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity. Opening acquired land in this new division to wildlife observation and photography will provide visitors a chance to see and photography a variety of wildlife species in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
*Within 1 year of acquiring land:*
- Allow public access from 30 minutes before sunrise to 30 minutes after sunset for wildlife observation and photography.
- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*
- Develop a public access strategy and required planning (e.g., NEPA compliance and compatibility determinations) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*
- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of acquiring land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, boat access, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge visitor services plan.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
Develop compatible opportunities on Quonatuck Division that promote state and watershed-wide initiatives that facilitate wildlife observation and photography, such as the Connecticut River Birding Trail and state roadside wildlife viewing areas, and which raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
Watershed-wide recreational trails and initiatives give individuals opportunities to view and photography wildlife throughout the Connecticut River watershed. Examples include the Connecticut River Birding Trail, the Connecticut River Byway, the Connecticut River Paddler's Trail, and the newly designated Connecticut River Watershed Blueway. Where appropriate, we will work with these partners to promote, and distribute information about these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- Work with partners to support and promote watershed-based wildlife observation and photography opportunities, such as the Connecticut River Birding Trail.
- Make guides and published materials supporting the Connecticut River Byway and the Connecticut River Watershed Blueway available at the visitor contact station.

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Quonatuck Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River Birding Trail, the Connecticut River Byway, the Connecticut River Paddler's Trail, and the newly designated Connecticut River Watershed Blueway. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- Work with partners to support and promote regional water-based trail initiatives.
- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Quonatuck Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
*Within 1 year of acquiring land:*

- Allow hiking, snowshoeing, and cross-country skiing in designated areas.
- Allow petwalking; pets must be on a leash no longer than 6 feet long and must be under the control of their owners/handlers to avoid posing a threat to other visitors, staff, or wildlife.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Consider providing boat access (e.g., trails to water, boat launches for motorized boats and canoes and kayaks).

Friends of Conte Refuge

*Pine Brook on the Proposed Salmon Brook Division, Connecticut*

# State of Connecticut

- **Farmington River Conservation Focus Area (Proposed)**
- **Maromas Conservation Focus Area (Proposed)**
- **Pyquag Conservation Focus Area (Proposed)**
- **Salmon Brook Conservation Focus Area (Proposed)**
- **Salmon River Conservation Focus Area (Existing Refuge Division)**
- **Scantic Conservation Focus Area (Proposed)**
- **Whalebone Cove Conservation Focus Area (Existing Refuge Division)**
- **Dead Man's Swamp Unit (Existing Refuge Unit)**
- **Roger Tory Peterson Unit (Existing Refuge Unit)**

# Overview
# Farmington River Conservation Focus Area (Proposed)

## Colebrook, Connecticut and Sandisfield, Massachusetts

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 8,866 | 89.2 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *8,866* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 1,072 | 10.8 % |
| Total Acres in CFA[2, 4] | 9,938 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The Farmington River was an SFA in the 1995 FEIS. The proposed Farmington River CFA is located in an area identified by the State of Connecticut as a priority for conservation. The proposed CFA is surrounded by a network of existing conserved lands including Tunxis State Forest (CT), Algonquin State Forest (CT), Granville State Forest (MA), Sandisfield State Forest (MA), Connecticut Metropolitan District Commission's Farmington River Watershed lands, and numerous other privately conserved lands. Additional land protection by the Service in this area will help better connect these conserved lands. The area's habitat is currently structurally and functionally sound and is projected to be resilient to climate change.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 80.7%
- Freshwater Marsh – 0.6%
- Shrub swamp and floodplain forest – 0.8%

For more information on habitats in the CFA, see map A.4 and table A.2.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.3 below, there are eight priority refuge resources of concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA, including a Federal candidate species. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and forest interior dwelling bird species. These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   The Farmington River CFA occurs within two of the 49 New England cottontail Focus Areas (NECFA) which span six states. These focus areas are locations to manage and restore habitat for New England cottontail. New England cottontail is a candidate species for listing under the Endangered Species Act, and is a species of greatest conservation need in Connecticut. "A Conservation Strategy for the New

England cottontail" was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller and Tur 2012).We plan to work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. We will manage approximately 375 acres of forest in early successional habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a habitat management plan is completed.

American eel spend the majority of their young life in freshwater systems. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

2. **Migratory Birds**
The Connecticut River watershed is a major migration corridor for birds. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem. Migrants are also known to use habitats beyond the Connecticut River main stem within the watershed, though in lower concentrations (Smith College 2006). The Farmington River CFA is less than 20 miles from the Connecticut River and contains large tracts of forested and riparian habitat. These habitats provide stopover areas for a diversity of species including wood thrush, Canada warbler, black-throated blue warbler, black-throated green warbler, red-eyed vireo, American redstart, and yellow-bellied sapsucker (Smith College 2006). This CFA also provides breeding habitat for a diversity of bird species.

The PRRC bird species for the Farmington River CFA includes wood thrush, chestnut-sided warbler and Canada warbler. This CFA is located within their core breeding range, and the contiguous forests provide breeding habitat for these and other priority conservation concern species. Habitats also support nesting and migrating bald eagle populations, which is another PRRC species.

3. **Waterfowl**
Potential breeding and foraging habitat for American black duck (a PRRC species), wood duck, Canada geese, and other waterfowl species within wetlands adjacent to slow moving streams and open water habitats.

4. **Diadromous fish and other aquatic species**
PRRC species in the Farmington River CFA include American eel, a species petitioned for listing under the Endangered Species Act, and Eastern brook trout. These species are also State SGCN and a conservation priority for the Service's northeast region. The Farmington River supports the highest diversity of mussels in the Connecticut River watershed, though the majority of these occurrences are in the lower reaches. The West Branch of the Farmington River occurs along the eastern boundary of the Farmington River CFA. This branch was damned by the Army Corps of Engineers for flood control, creating Colebrook Lake Reservoir and West Branch Reservoir. These reservoirs are stocked with trout to complement the occurrence of bass, pickerel, perch, brown bullhead, and bluegill. The CTDEEP also stocks Atlantic salmon fry into Sandy Brook, which is within the CFA, as part of its Atlantic Salmon Legacy Program. Future restoration of other diadromous species, such as sea lamprey is being proposed by CTDEEP once aquatic species passage is provided at the Collinsville dams.

5. **Wetlands**
The Farmington River CFA contains 175 acres of hardwood swamp, 90 acres of conifer swamp, 81 acres shrub-swamp and floodplain forest, and 63 acres of freshwater marsh. Many of these wetlands occur along slow moving streams or small ponds. Habitat patches range from 2 acres to 63 acres in size.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

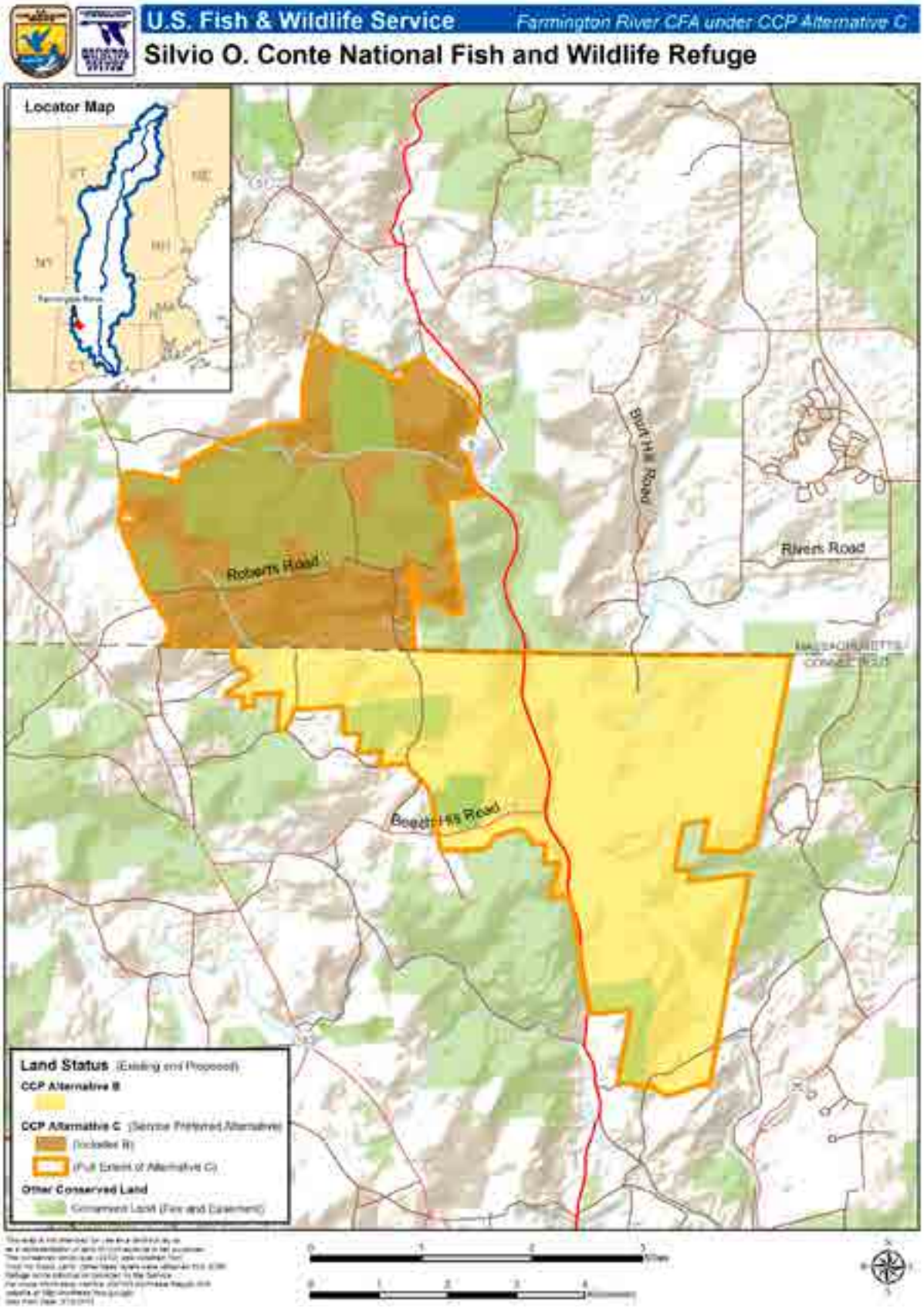
We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and native species will dominate. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- Open water (i.e., stream, rivers, and ponds) will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

*Map A.3. Farmington River CFA – Location.*



*Map A.4. Farmington River CPA/CFA – Habitat Types.*

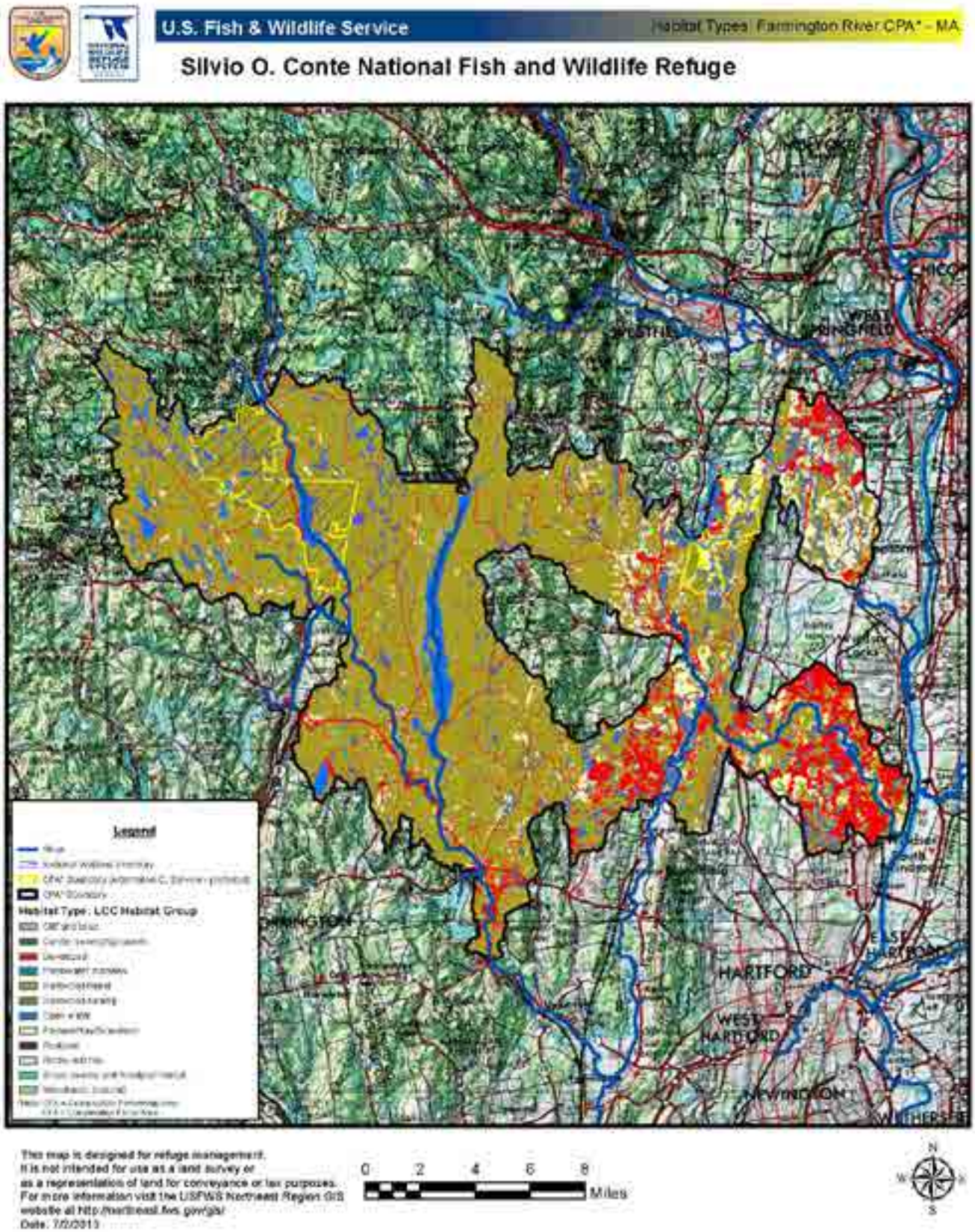


**Table A.2. Farmington River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 368 | 0.2% | 90 | 2 | 0 | 0.9% | 24.6% |
| Hardwood forest | 126,414 | 68.2% | 8,021 | 1,009 | 0 | 80.7% | 6.3% |
| Hardwood swamp | 8,355 | 4.5% | 175 | 3 | 0 | 1.8% | 2.1% |
| Shrub swamp and floodplain forest | 1,392 | 0.8% | 81 | 0 | 0 | 0.8% | 5.8% |
| Woodlands (natural) | 483 | 0.3% | 80 | 18 | 0 | 0.8% | 16.6% |
| *Forested uplands and wetlands subtotal* | *137,013* | *73.9%* | *8,447* | *1,032* | *0* | *85.0%* | *6.2%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 603 | 0.3% | 88 | 8 | 0 | 0.9% | 14.6% |
| Freshwater marshes | 804 | 0.4% | 63 | 0 | 0 | 0.6% | 7.8% |
| Pasture/hay/grassland | 16,907 | 9.1% | 112 | 7 | 0 | 1.1% | 0.7% |
| Peatland | 31 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky outcrop | 25 | 0.0% | 4 | 0 | 0 | 0.0% | 17.7% |
| *Non-forested uplands and wetlands subtotal* | *18,370* | *9.9%* | *267* | *16* | *0* | *2.7%* | *1.5%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 6,498 | 3.5% | 884 | 0 | 0 | 8.9% | 13.6% |
| *Inland aquatic habitats subtotal* | *6,498* | *3.5%* | *884* | *0* | *0* | *8.9%* | *13.6%* |
| **Other** | | | | | | | |
| Developed | 23,550 | 12.7% | 339 | 9 | 0 | 3.4% | 1.4% |
| *Other subtotal* | *23,550* | *12.7%* | *339* | *9* | *0* | *3.4%* | *1.4%* |
| **TOTAL** | **185,430** | **100.0%** | **9,938** | **1,056** | **0** | **100.0%** | **5.4%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.3. Farmington River CFA – Preliminary Priority Refuge Resources of Concern**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 8,021 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | American Redstart[A,I,J]<br>Black-billed Cuckoo[A,I,J]<br>Broad-winged hawk[I,J.K]<br>Eastern Wood-pewee[A,I,J]<br>Sharp-shinned Hawk[I,J,K]<br>**Eastern Red Bat**[K]<br>**Ovenbird**[A]<br>Red-shouldered Hawk[I,J]<br>Barred Owl[I]<br>Eastern Box Turtle[I]<br>Blue-headed Vireo[I]<br>Scarlet Tanager[I,J]<br>Black-and-white Warbler[I,J]<br>Baltimore Oriole[I,J]<br>Jefferson Salamander[I.J,K]<br>Northern Flicker[A,I,J]<br>Rose-breasted Grosbeak[A,I]<br>Black-throated Blue Warbler[A,I]<br>Black-throated Green Warbler[A,I]<br>Black Bear[I.K]<br>Prairie Warbler[I]<br>Ruffed Grouse[A,I,K]<br>Eastern Towhee[I]<br>**Louisiana Waterthrush**[I,K]<br>Yellow-bellied Sapsucker[A,I]<br>Brown Thrasher[K] |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| New England Cottontail[B, D] | Year round habitat includes dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | |
| **Chestnut-sided Warbler**[A, B, K] | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Bald Eagle[C, G] | Breeding habitat includes large bodies of water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf et al. 2001). | |
| **Hardwood Swamp[5] - 175 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | **Northern Waterthrush**<br>Red-shouldered Hawk[IJ]<br>Veery[A,I,J]<br>White-eyed Vireo[J]<br>Wood Duck[A]<br>Northern Parula[A,I,K]<br>Black-throated Green Warbler[A,I]<br>Purple Finch [A,I]<br>Blackburnian Warbler[A,I] |
| **Conifer Swamp[5] - 90 acres** | | |
| Canada Warbler[A,B,C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | Red-shouldered Hawk[IJ]<br>Veery[A,I,J]<br>White-eyed Vireo[J]<br>Wood Duck[A]<br>Northern Parula[A,I,K]<br>Black-throated Green Warbler[A,I]<br>Purple Finch [A,I]<br>Blackburnian Warbler[A,I] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 81 acres** | | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Chestnut-sided Warbler[A,I]<br>Ruffed Grouse[A, I, K]<br>Eastern Ribbon Snake[K]<br>**Warbling Vireo[I]**<br>**Spotted Turtle[K]**<br>American Redstart[A,I, J]<br>Eastern Kingbird[I,J]<br>Gray Catbird[I,J]<br>Eastern Towhee[I,K]<br>White-throated Sparrow[K]<br>Wood Duck[A]<br>**Willow Flycatcher[I,K]**<br>Black Racer[K]<br>American Woodcock[A,I,J] |
| New England Cottontail[B, D] | Year round habitat includes shrub swamps of at least 25 acres that are within 1 km of other shrub swamps, and early successional forest patches (Arbuthnot 2008, DeGraaf et al. 2001). | |
| **Woodlands (natural)[5] - 80 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 63 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **Marsh Wren[K]**<br>**American Bittern[A,I,K]**<br>Eastern Ribbon Snake[I,K]<br>Northern Harrier[A,I,J,K]<br>Spotted Turtle[I,K]<br>Bridle Shiner[I,K]<br>Canada Goose[A,J]<br>Wood Duck[J] |
| **Pasture/Hay/Grassland[5] – 112 acres** | | |
| New England Cottontail[B, D] | Year round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | Field Sparrow[I,J,K]<br>Northern Harrier[A,I,J,K]<br>**Grasshopper Sparrow[I]**<br>Prairie Warbler[I,K]<br>**Bobolink[A,I]**<br>**Eastern Meadowlark[I]**<br>American Woodcock[A,I,J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] – 88 acres** | | |
| North-central Appalachian acidic cliff and talus[H]<br><br>North-central Appalachian circumneutral cliff and talus[H] | The *North Central Appalachian acidic cliff and talus system* comprises sparsely vegetated to partially wooded cliffs. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be comparatively well-developed and different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. Eastern red cedar is a characteristic tree species, poison ivy a characteristic woody vine, and common polypody a characteristic fern. Substrates within the *circumneutral cliff and talus system* include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood, and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Rocky Outcrop[5] – 4 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | The Northern Appalachian-Acadian rocky heath outcrop system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Low-bush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 884 acres** | | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Burbot[I,K]<br>Eastern Silvery Minnow[K]<br>Longnose Dace[I,K]<br>Longnose Sucker[I,K]<br>Creek Chubsucker[I,K]<br>Harpoon Clubtail[I,K]<br>Rapids Clubtail[I,K]<br>Riverine Clubtail[I,K] |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/ streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A: 2008 Bird Conservation Region 14.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

K: 2005 Massachusetts Comprehensive Wildlife Conservation Strategy

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Farmington River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, chestnut-sided warbler, Canada warbler, New England cottontail, and bald eagle.

***Rationale:***
We envision healthy forests within the Farmington River CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Connecticut and Massachusetts wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Farmington River CFA hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is certainly available within the CFA. To date our review of the Farmington River CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to use characteristics common to these habitats. Our understanding of the forest structure within the Farmington River CFA comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Farmington River are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003).Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For many woodland species, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within the Farmington River CFA will contain a variety of patches in different size classes and developmental stages; it is not uniform throughout. This diversity of size classes provides a variety of species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve size class diversity through the creation of early-successional forests— habitat in decline in portions of the watershed. The USFWS New England cottontail initiative has identified focus areas, including the Farmington CFA, where the decline in early successional habitats is a particular problem for the New England cottontail. New England cottontail is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut and Massachusetts.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of 15 or more habitat patches, several of which are 25 acres or more. Each habitat patch should be one mile or less from each other to aid in New England cottontail movement between patches (Fuller et al 2012). Approximately, 375 acres of forest will be managed in early successional habitat in support of New England cottontail in the CFA. Another species of conservation concern that will use these habitat patches is American woodcock. High quality woodcock habitat includes young forest patches within a mile of feeding areas. New England cotton tail habitat patches will be placed in the vicinity of shrub wetlands, where feasible, to benefit this species. If early successional habitat is lacking within the landscape, we will provide other strategically located patches with these conditions to support other species of conservation concern such as chestnut-sided warbler, brown-thrasher, eastern towhee, black and white warbler, blue-winged warbler, eastern red bat, and ruffed grouse (DeGraaf et al. 2006).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Farmington River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance to species like Canada warbler. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003) And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who dwell in the upper canopies of conifers, and are thought to be strongly associated with the hemlock forests within Farmington River. Blackburnian warblers have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches of greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near the open bodies of water within the Farmington River CFA, are used by bald eagles. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that use large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the northern flicker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. Plan to manage approximately, 375 acres of forest in early successional habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a habitat management plan is completed.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

**Sub-objective 1.1b. (Hardwood Swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for priority refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Farmington River CFA, hardwood swamps have often undergone significant alteration and have great potential for restoration. This habitat type is often in basins, or on gently sloping seepage lowlands. Examples of this forest type may be found in small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the watertable and the nutrient-poor soils drive complexes of forest upland and wetland species including eastern hemlock, red maple, and black gum. Within the Connecticut River watershed, including this CFA, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions and soil compaction remain as threats

Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated

softwood species. Our conservation efforts within the Farmington River will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Many species of conservation concern use forested swamps, including northern parula, willow flycatcher, white-eyed vireo and rose-breasted grosbeak. Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well-developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Hardwood swamps in the Farmington River CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Hardwood swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the CFA, and allow monitoring of population response to management actions (Dettmers personal communication 2013).

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites. Hardwood swamp stands with relatively large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the states of Massachusetts and Connecticut in support of the state wildlife action plans, to ensure management on Service lands complement adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Conifer Swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Farmington River CFA, conifer swamps have often undergone significant alteration and have potential for restoration. This habitat type is often found in small patches on mineral soils that are nutrient poor; there may be an organic layer, but generally deep peat soils are

absent. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. The dynamic nature of the watertable drives complexes of forest upland and wetland species including red maple, balsam fir, red spruce, and ash species. Where soils tend more to alkaline conditions white cedar is a common tree species, and the shrub layer is generally more diverse. Within the Connecticut River watershed, and within the CFA, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions and soil compaction remain as threats.

Successional trends in conifer swamps are not well understood. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Farmington River will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Where needed, restoration of softwood swamp habitats will create high-quality habitat for neotropical migratory birds. Closed canopy softwood forests that include white cedar and other softwoods provide important mast, food, nesting, and cover. Softwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well-developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Conifer swamps in the Farmington River CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Conifer swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the states of Massachusetts and Connecticut in support of the state wildlife action plans, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1d. (Shrub Swamps and Floodplain Forests)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide habitat for priority refuge resources of concern including American black duck and New England cottontail.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008).These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. Our coarse-scale habitat analysis of this CFA identifies a shrub swamp wetland complex in the northwestern portion of the CFA. The landscape mosaic of dense shrubs, grassy openings, flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including New England cottontail and American black duck, priority resources of concern.

New England cottontail is a candidate species for listing under the Endangered Species Act, and is a species of greatest conservation need in Connecticut and Massachusetts. The historic range of this species likely included southeastern New York, north through the Champlain Valley and into southern Vermont, New Hampshire and Maine, and statewide in Massachusetts, Connecticut and Rhode Island. Due to loss of early successional habitat to development and forest maturation, this species occupies less than a fifth of its historical range (Fuller and Tur 2012). New England cottontail is no longer sustaining a viable population, and given this conservation urgency, a range-wide New England cottontail Initiative was established. This initiative involves collaboration from multiple agencies, including the USFWS, state wildlife agencies, universities, Natural Resources Conservation Service, The Nature Conservancy, and Wildlife Management Institute, to address cottontail conservation on a landscape scale.

Focus areas were identified as locations to manage and restore habitat for New England cottontail. The Farmington River CFA was one of forty-nine focus areas in six states. Early successional management and protection of adjacent natural shrubland habitat, such as shrub swamps, will meet the conservation goals set for the New England cottontail. “A Conservation Strategy for the New England cottontail” was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller and Tur 2012).

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season, and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests in uplands or dry hummocks near wetland foraging habitat (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 30. An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for American black duck.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Incorporate shrub swamps, where appropriate, into the network of habitat patches required for New England cottontail.
- Work with partners, including the state in support of their state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1e. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management

and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Farmington River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a distinctive flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is limited. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the states of Massachusetts and Connecticut in support of their state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submerged herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrsh, jewelweed, marsh fern, water lily and narrow-leaved cattail (Gawler 2008). Our coarse-scale habitat analysis of this CFA identifies freshwater marsh habitat along Thorp Brook and around the perimeter of an unnamed pond off Roberts Road.

These wetlands are adjacent to a slow moving stream, and open water, providing foraging, and potentially breeding habitat for American black duck, and other waterfowl species. Black ducks place well-concealed nests on the ground in adjacent uplands or hummocks within wetlands, and adults and their broods feed on seeds and herbaceous vegetation, as well as invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for American black duck.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate wetland hydrology for impacts to natural flow regimes.
- Work with partners, including the states in support of their state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Inventory wetland plant communities.
- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Provide appropriate conditions within current pasture, hay, and grassland acreage that will support New England cottontail (where appropriate) and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Over one percent of the Farmington River is typed as pasture, hay and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support many grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler, field sparrow, American woodcock, blue-winged warbler, and New England cottontail, a species petitioned for Federal listing.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occur in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Another species of conservation concern that uses shrubland dominated habitat is New England cottontail. This species is New England cottontail is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut and Massachusetts. The Farmington River CFA is a New England cottontail Focus Area, which are areas identified as locations to manage and restore habitat for New England cottontail. New England cottontail require early successional habitat (dense shrubs and tree saplings), and the pastures, hay fields, and grasslands in the CFA will provide this habitat with very little initial manipulation.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of fifteen or more habitat patches, several of which are 25 acres or more. Each habitat patch should be one mile or less from each other to aid in New England cottontail movement between patches (Fuller and Tur 2012).Where appropriate, pastures, hay fields, and grasslands will be incorporated into the network of patches managed for New England cottontail by allowing woody stem colonization.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat

if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
See the rationale for sub-objective 1.1e.

Habitats that occur within the Farmington River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the states of Massachusetts and Connecticut, in support of the state wildlife action plans, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and American eel, as well as other species of conservation concern such as sea lamprey.

***Rationale:***
The Farmington River supports the highest diversity of mussels in the Connecticut River watershed, though the majority of these occurrences are in the lower reaches. The West Branch of the Farmington River occurs along the eastern boundary of the Farmington River CFA. This branch has been damned by the Army Corps of Engineers for flood control, and the Colebrook Lake Reservoir and West Branch Reservoir were created. These reservoirs are stocked with trout to complement the occurrence of bass, pickerel, perch, brown bullhead, and bluegill. The CTDEEP also stocks Atlantic salmon fry into Sandy Brook, which is within the CFA, as part of its Atlantic Salmon Legacy Program. Future restoration of other diadromous species, such as sea lamprey is being proposed by CTDEEP once aquatic species passage is provided at the Collinsville dams.

American eel, a species petitioned for listing under the Endangered Species Act, is present in the West Branch, and many of the small streams and brooks support Eastern brook trout. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000). Brook trout are sensitive to extreme temperature fluctuations, and require water temperatures between 40-70 degrees Fahrenheit for spawning, growth, and survival. Forested buffers along stream edges, a structurally diverse instream habitat, with boulders and downed woody debris providing riffles and pools, and clear aquatic species passage to spawning and wintering habitat is important to maintain habitat requirements for brook trout, and other aquatic species.

A comprehensive, multi-scale habitat and wildlife inventory will be necessary to understand aquatic and surrounding habitat conditions in the CFA. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Collaborate with partners in the Farmington River Coordinating Committee to strategically prevent and manage invasive species within the 14-mile stretch of the Upper Farmington River that is designated as Wild and Scenic River and abutting lands.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate stream and fish community health.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, summer camps, and other youth educational organizations to develop curricula that use the Farmington River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Farmington River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Farmington River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Farmington River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Farmington River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Farmington River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Farmington River Division's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of acquiring sufficient land and CCP approval:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Farmington River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land and CCP approval:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land and CCP approval:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Farmington River Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures (e.g., general brochure and bird checklist) that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land and CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Farmington River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Farmington River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
The Farmington River CFA is a popular area to hunt white-tailed deer, Eastern wild turkey, black bear (Massachusetts), and small game. Existing public hunting areas include Sandisfield State Forest in Massachusetts, Algonquin and Tunxis State Forests in Connecticut. Hunting would be allowed on a newly created division, consistent with the final compatibility determination. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions in Connecticut to support a safe, manageable hunt program.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring sufficient land to support hunting seasons:*
- Work with Massachusetts Department of Fish and Game and Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disable hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with Massachusetts Department of Fish and Game and Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of acquiring sufficient land to support hunting seasons:*
- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Farmington River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*
- Work with Massachusetts Department of Fish and Game and Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Farmington River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Massachusetts Department of Fish and Game and Connecticut Department of Energy and Environmental Protection regulations, and Division-specific conditions, if necessary.

***Rationale:***
There are several rivers in the proposed CFA including the West Branch of the Farmington River and Sandy Brook. Both rivers support a cold water fishery that includes Eastern brook trout. A variety of other game fish are found in streams and ponds within the CFA. Fishing is a popular activity throughout this area and would continue under Service ownership, consistent with the final compatibility determination. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The Farmington River Division would be open to visitors actively engaged in fishing during the seasons and times established by the respective states in their annual fishing regulations.

*Within 5 years of acquiring land:*

- Produce a brochure that highlights fishing opportunities for distribution at a division kiosk and the refuge web site.
- Work with the Massachusetts Department of Fish and Game and Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the division.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses.)

*Within 1 year of acquiring land:*

- Consistent with the final compatibility determination, allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exceptions listed for hunters and anglers. The refuge manager may issue a special use permit for public uses during the closed hours.
- Install an informational kiosk to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses.)

*Within 1 year of acquiring land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools, groups, and environmental organizations to include wildlife-centered trips to the refuge.

- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
Develop compatible opportunities in the Farmington River CFA that promote state and watershed-wide initiatives that facilitate wildlife observation and photography and which raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
There are many partners active in the Farmington River watershed, including the Farmington River Watershed Committee. We would work with partners to help achieve shared conservation and recreation goals.

**Management Strategies:**
*Within 5 years of acquiring land:*

- Work with local and regional organizations that have developed conservation and recreation plans to implement these plans to the extent that they are compatible and consistent with refuge management.

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Farmington River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Farmington River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Farmington River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that the use is both appropriate and compatible.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge properties.

# Overview
# Maromas Conservation Focus Area (Proposed)

## Middletown, Connecticut

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 3,935 | 90.7 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *3,935* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 400 | 9.3 % |
| Total Acres in CFA[2, 4] | 4,335 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## Maromas

The proposed Maromas CFA is a large, forested upland area bounded by the mainstem of Connecticut River on two sides. Its proximity to Middletown and other urbanized areas provides an important opportunity to connect with urban audiences and contribute to the Service's Urban Refuge initiative. The proposed CFA is also directly across the Connecticut River from the refuge's existing Salmon River Division. Conserving these two divisions will help provide connectivity on both sides of the river. The Maromas CFA provides a connection between two undeveloped forest corridors located in the Lower Connecticut River and, further north, along the Bolton Range. These corridors have been recognized for their lack of development, and their importance to neotropical migrants (Comins 2013, personnel communication). The Bolten Range corridor extends into Massachusetts, and provides forest bird nesting habitat. Other existing conserved lands near the Maromas CFA include the Seven Falls, George Dudley Seymour, and Hurd State Parks.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 81.3%
- Shrub swamp and Floodplain Forest –1%

For more information on the habitats in the CFA, see map A.5 and table A.4.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.5 below, there are 10 priority refuge resources of concern (PRRC); specifically, terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and forest interior dwelling bird species. These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   The Connecticut River is important migratory and overwintering habitat for shortnose sturgeon, a federally listed species. American eel, a species petitioned for federal listing, spends the majority of its young life in the freshwater systems of this CFA.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Maromas CFA is situated on the Connecticut River, and the forested habitat and wetlands provide important stopover and breeding habitat for landbirds.

   The Maromas CFA provides a connection between two undeveloped forest corridors located in the Lower Connecticut River and, further north, along the Bolton Range. These corridors have been recognized for their lack of development, and their importance to neotropical migrants (Comins 2013, personnel communication). The Bolten Range corridor extends into Massachusetts, and provides forest bird nesting habitat.

   The PRRC species for the Maromas CFA includes wood thrush and Louisiana waterthrush. This CFA is located within their core breeding range, and the contiguous forests provide breeding habitat for these and other forest nesting birds, many of which are priority conservation concern species. Bald eagles are also a PRRC species for this CFA. Habitats support nesting, migrating and wintering bald eagle populations.

3. **Waterfowl**
   The freshwater tidal shrub-swamp, marsh and hardwood swamp within the Maromas CFA provide breeding, stopover and wintering habitat for waterfowl. These wetland communities are used by American black duck (a PRRC species), green-winged teal, common merganser, mallards, bufflehead, and wood ducks.

4. **Diadromous fish and other aquatic species**
   The Maromas CFA is located along the Connecticut River which provides important habitat for PRRC species including American shad, shortnose sturgeon, American eel, alewife, blueback herring and Atlantic salmon. The Connecticut River is important migratory habitat for Atlantic salmon, American shad, and shortnose sturgeon (a federally listed species), and spawning habitat for river herring. This area of the Connecticut River is also important as overwintering habitat for shortnose sturgeon. American eel spend the majority of their young life in freshwater systems. Sea lamprey, another species of conservation concern, occurs in this CFA providing important ecological benefits to aquatic systems.

5. **Wetlands**
   An approximately 60 acre tidal wetland complex is located in the Maromas CFA adjacent to the Connecticut River. This wetland complex contains approximately 12 acres of emergent marsh, 5 acres of hardwood swamp and 43 acres shrub-swamp and floodplain forest. Another 20 acres of hardwood swamp is located upstream of this wetland complex, and additional smaller patches are scattered throughout the CFA.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

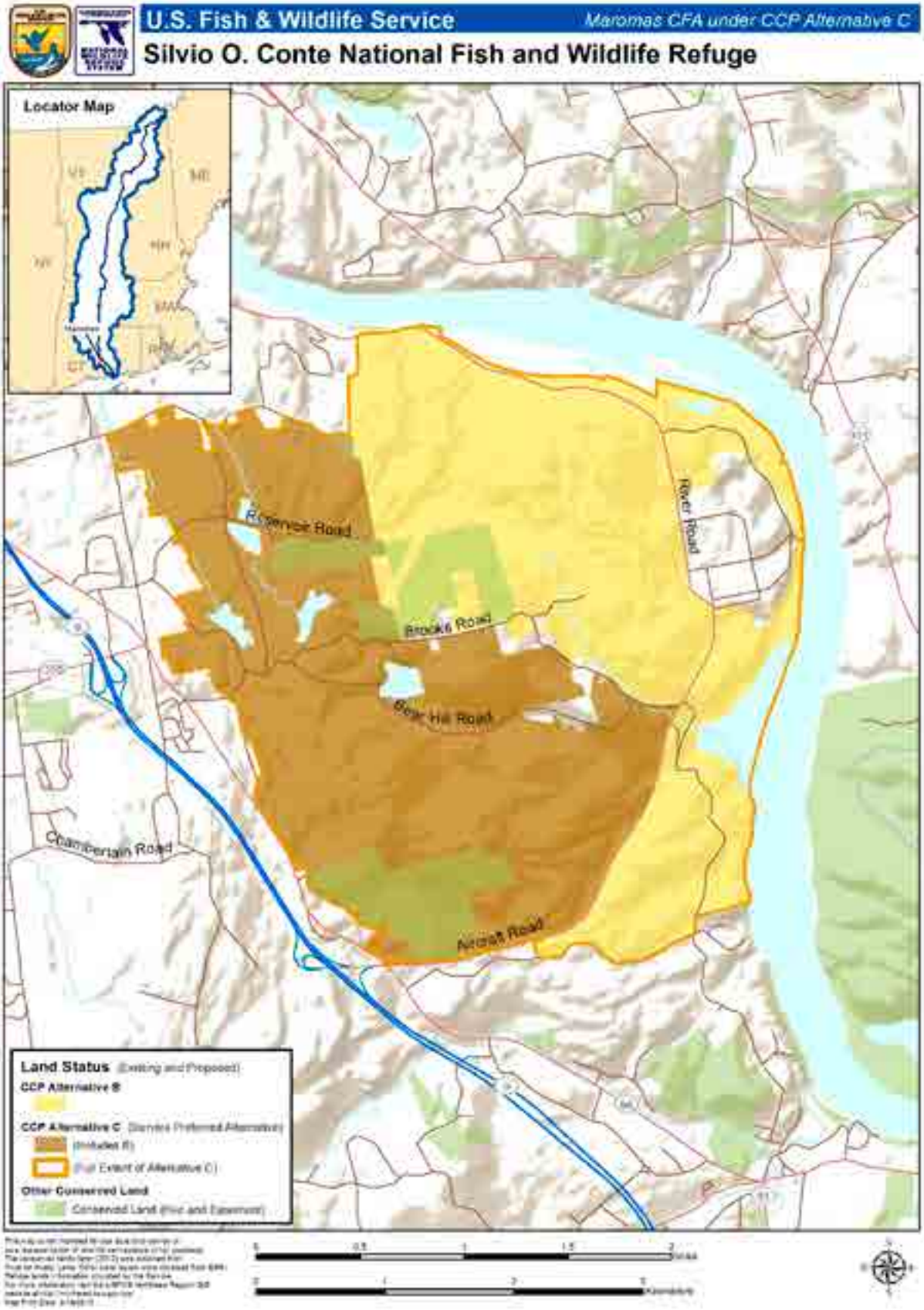
We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested, and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide a structurally diverse mature forest with connectivity to other large forest blocks, and species composition will be appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- We will also manage tidal wetland habitats, and will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (i.e., stream, rivers, and ponds) habitats, we will focus on maintaining in-stream connectivity (i.e., eliminating barriers to aquatic species passage) and water quality.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, interpretation, and environmental education.

*Map A.5. Maromas CFA – Location.*



*Map A.6. Maromas CPA/CFA – Habitat Types.*

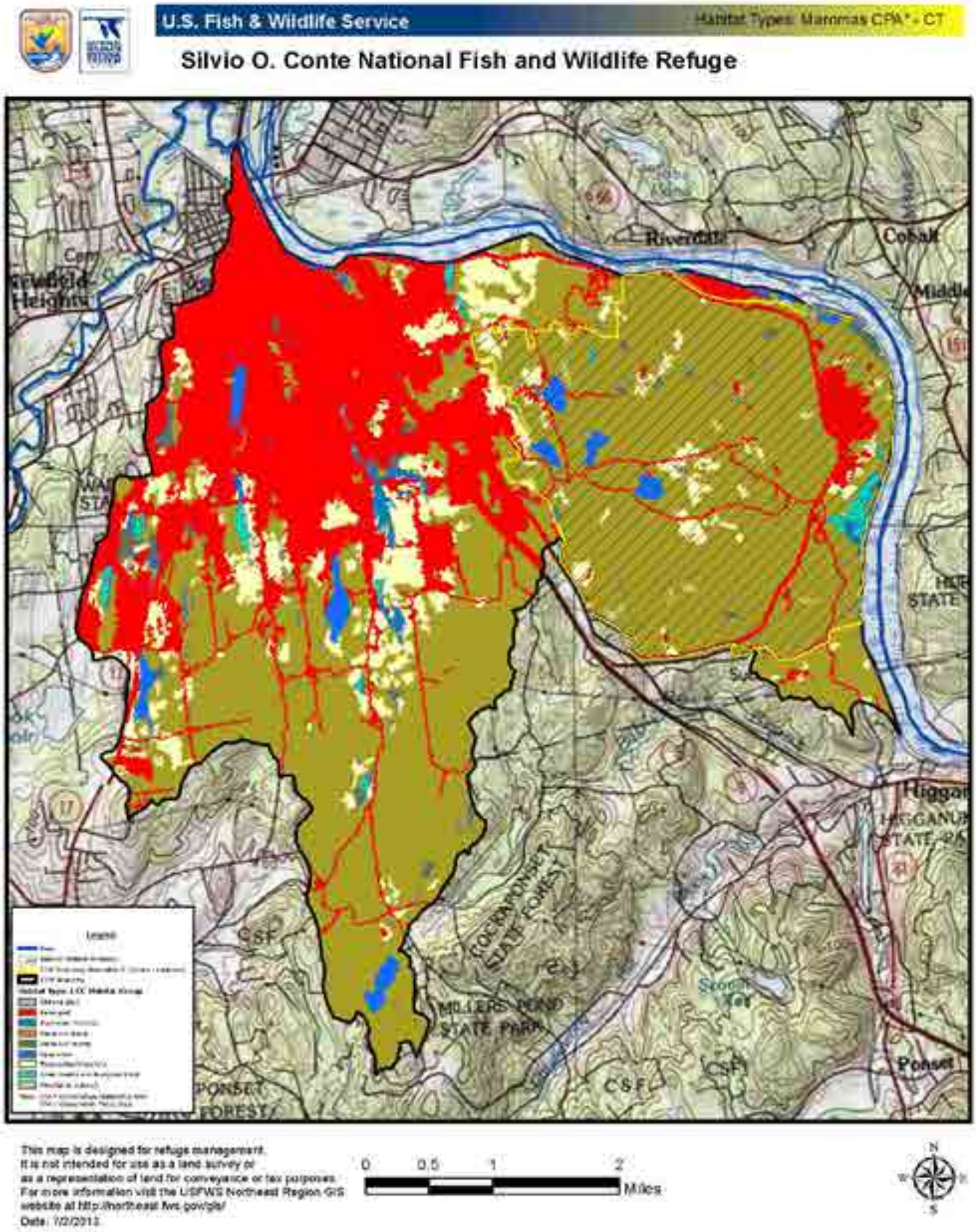


**Table A.4. Maromas CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Hardwood forest | 8,254 | 56.5% | 3,744 | 372 | 0 | 81.3% | 45.4% |
| Hardwood swamp | 147 | 1.0% | 46 | 0 | 0 | 1.0% | 31.0% |
| Shrub swamp and floodplain forest | 105 | 0.7% | 47 | 0 | 0 | 1.0% | 44.6% |
| Woodlands (natural) | 21 | 0.1% | 21 | 8 | 0 | 0.5% | 100.0% |
| *Forested uplands and wetlands subtotal* | *8,527* | *58.4%* | *3,858* | *381* | *0* | *83.8%* | *45.2%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 7 | 0.0% | 3 | 3 | 0 | 0.1% | 37.5% |
| Freshwater marshes | 84 | 0.6% | 12 | 0 | 0 | 0.3% | 13.8% |
| Pasture/hay/grassland | 1,252 | 8.6% | 223 | 5 | 0 | 4.8% | 17.8% |
| *Non-forested uplands and wetlands subtotal* | *1,343* | *9.2%* | *237* | *8* | *0* | *5.2%* | *17.7%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 259 | 1.8% | 89 | 0 | 0 | 1.9% | 34.6% |
| *Inland aquatic habitats subtotal* | *259* | *1.8%* | *89* | *0* | *0* | *1.9%* | *34.6%* |
| **Other** | | | | | | | |
| Developed | 4,470 | 30.6% | 421 | 7 | 0 | 9.1% | 9.4% |
| *Other subtotal* | *4,470* | *30.6%* | *421* | *7* | *0* | *9.1%* | *9.4%* |
| **TOTAL** | **14,598** | **100.0%** | **4,605** | **395** | **0** | **100.0%** | **31.5%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.5. Maromas CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 3,744 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | American Redstart[I,J]<br>Black-billed Cuckoo[I,J]<br>Broad-winged hawk[A,I,J]<br>Eastern Hognose Snake[I]<br>Eastern Wood-pewee[I,J]<br>Great-crested Flycatcher[A,I]<br>Hooded Warbler[I,J]<br>Sharp-shinned Hawk[I,J]<br>Yellow-throated Vireo[A,I,J]<br>**Eastern Red Bat[I]**<br>**Ovenbird[J]**<br>Red-shouldered Hawk[I,J]<br>Purple Finch[I]<br>Barred Owl[I]<br>Eastern Box Turtle[I]<br>Acadian Flycatcher[I,J]<br>Blue-headed Vireo[I]<br>Scarlet Tanager[A,I,J]<br>Black-and-white Warbler[A,I,J]<br>Baltimore Oriole[A,I,J]<br>Jefferson Salamander[I]<br>Worm-eating Warbler[I,J]<br>Northern Flicker[A,I,J]<br>Cerulean Warbler[A,I,J] |
| **Louisiana Waterthrush**[A] | Breeding habitat includes contiguous (250+ acres) mature deciduous or mixedwood forests along medium to high-gradient, first to third-order, perennial streams (Mattsson et al. 2009, Degraaf et al., 2001). | |
| Bald Eagle[C, G] | Breeding, migrating and wintering habitat includes large bodies of open water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf et al. 2001). | |
| **Hardwood Swamp[5] - 46 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-Central Interior and Appalachian rich swamp[H] | Eastern hemlock is usually present and may be dominant in the *North-Central Appalachian acidic swamp system*. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-Central Interior and Appalachian rich swamps* are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include red maple, black ash (*Fraxinus nigra*), as well as calcium loving (calciphilic) herbs. Conifers include American larch, but typically not Northern white cedar, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 47 acres** | | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **Spotted Turtle[I]p**<br>**Warbling Vireo[I]**<br>**Willow Flycatcher[A,I]**<br>American Redstart[I,J]<br>Gray Catbird[A,I,J]<br>Wood Duck[J]<br>Chestnut-sided Warbler[I]<br>Eastern Towhee[A]<br>Brown Thrasher[A,I]<br>Alder Flycatcher[I] |
| **Woodlands (natural)[5] - 21 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 12 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland[5] – 223 acres** | | |
| Where appropriate and supported by the local community, restore to forest habitat types | See species composition and structure above. | See species associated with forested habitat types above. |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] – 3 acres** | | |
| North-central Appalachian circumneutral cliff and talus[H] | This cliff system occurs at low to mid elevations and consists of vertical or near-vertical cliffs and steep rocky slopes. Substrates include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern (Gawler 2008) . | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 89 acres** | | |
| Alewife[B, F, G] | Spawn in ponds and slow-moving streams (USFWS 1996). | Smallmouth Bass[I]<br>Striped Bass[I]<br>Pumpkinseed[I]<br>Longnose Dace[I]<br>Yellow Perch[I] |
| American Eel[E, F] | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | |
| Atlantic Salmon[B, F, G] | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |
| American Shad[B, F, G] | Spawn when the water temperature is above 60° F in shoal area of river and lower reaches of larger tributaries (USFWS 1996). | |
| Blueback Herring[F, G] | Spawn in fast moving, shallow water when the river temperature is about 58 F (USFWS 1996). | |
| Shortnose Sturgeon[B, D, F, G] | Spawn in slow-moving, 48 F water of large rivers, and feed in fresh and brackish water along the river bottom (USFWS 1996). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service-preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Objectives and Strategies for Refuge Lands in the Maromas CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, Louisiana waterthrush, and bald eagle.

***Rationale:***
As a result of its history of fire, pathogens, wind events, and other meteorological disturbances and its remarkable cultural legacy of land cover transformations, the entire New England region is strongly shaped by historical processes. In the Maromas CFA, for example, although the landscape was largely forested prior to European settlement, it was highly dynamic in response to changing climatic conditions and natural disturbance processes. European settlement in the 17$^{th}$ and 18$^{th}$ centuries, including sawmills, gristmills, quarries, and shipping docks, initiated a dramatic transformation, as much of the land was deforested and farmed and the remainder was logged, grazed, or burned. More recently, agriculture and forest use have declined, forest area and age have increased, and the land has become more natural than at any time in the preceding centuries. However, despite the natural appearance of much of the Maromas CFA, a legacy of intensive past use remains in vegetation structure and composition, landscape patterns, and ongoing dynamics. This includes the decline in dominant tree species as a consequence of introduced pests and pathogens. The hemlock woolly adelgid, an introduced, aphid-like insect is spreading relentlessly across the range of eastern hemlock and causing widespread decline and mortality of this long-lived and shade tolerant species.

The forests within the CFA that have formed following agricultural abandonment are remarkably more homogeneous than those of four centuries earlier and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Foster et al. 1998). Modern forests also exhibit much weaker relationships to regional variation in physiography, climate, and soils. And at larger scales, the arrangement and structural and compositional characteristics of plant communities are largely the consequence of species-specific response to land-use histories and other edaphic (soil-related) factors (Foster 1995, Motzkin et al. 1996).

Gap dynamics were the most common natural disturbance, which led naturally to a forest structure dominated by late-successional, multi-aged stands (Foster and Zebryk 1993, Foster et al. 1996, Seymour et al. 2002). A combination of passive management and the application of silvicultural treatments designed to emulate gap dynamics will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics. Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, see also Rawinski 2008). The structure and composition of late-successional forest ecosystems have been detailed in numerous publications (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010). Four important structural attributes of late-successional forests are: live large-diameter trees, standing dead trees (snags), fallen trees or logs on the forest floor, and logs in streams. Additional important elements typically include multiple canopy layers, smaller understory trees, canopy gaps, and patchy understory development. These habitat elements have importance to declining mature forest-interior species like wood thrush and Louisiana waterthrush. The wood thrush nests and feeds at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). Louisiana waterthrush are strongly associated with the swift flowing streams in the forested, steep-sided valleys within Maromas, and

have been shown to decline in response to disturbance of forest cover, streambeds, and associated microhabitat features (Janssen 1987). The wood thrush and Louisiana waterthrush have significance within the Service as NALCC representative species for hardwood forests in the southern sub-region. The occurrence and distribution of many wildlife species are related to key structural habitat features within the forested habitat matrix. High exposed perching and nesting sites often are found in old fields, riparian corridors, and stands where an overstory tree clearly stands above the other forest vegetation; supracanopy white pines and hemlock are examples. The exposed nature of these high perches makes them excellent hunting sites for raptors such as bald eagles that forage in non-forested cover types and open forests. Current breeding territory within Maromas will be managed to perpetuate supracanopy trees.

The management priorities for this habitat type include protection of a large, contiguous forested block within a highly fragmented landscape. This protection coupled with improvements in seral stage diversity will benefit other species of conservation concern like eastern hognose snake, Jefferson salamander, worm-eating warbler, red-shouldered hawk, and hooded warbler.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State of Connecticut in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Reserve supracanopy trees in proximity to important habitats during management activities.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map vernal pools and seeps.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1b. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). Our coarse-scale habitat analysis of this CFA identifies a shrub swamp wetland complex adjacent to the Connecticut River. Flooding of this wetland complex during high water events provide a diversity of plant communities, and habitats for a variety of wildlife species, including American black duck, and other waterfowl species.

American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 30. Black ducks use wetlands, including shrub swamp communities, as stopover habitat during migration, and as breeding and

wintering habitat. Well-concealed nests are placed on the ground in nearby uplands or hummocks in wetlands, and adults and their broods forage on seeds, aquatic vegetation, and invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). The open water habitat and the adjacent wetland complex provide excellent wintering and migrating habitat for American black ducks. And located on the Connecticut River, an important migration corridor, these wetland communities are used by other waterfowl species during migration including green-winged teal, common merganser, mallards, bufflehead and wood ducks.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the Service has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-

filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.Habitats that occur within the Maromas River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Connecticut in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Pasture/Hay/Grassland)**
Where appropriate, and with local support, restore historic composition and structure, and improve landscape connectivity to support forest interior species and provide migratory stopover habitat.

***Rationale:***
Five percent of the Maromas CFA is typed as pasture, hay, and grassland habitat. While these habitats add to the diversity in the landscape, they also fragment the relatively contiguous forest block of the CFA. Adding up to almost 4,000 forested acres, the Maromas CFA is providing unfragmented habitat on the Connecticut River that is becoming increasingly rare in the southern portion of the watershed, especially with increasing development pressures. The forests within the CFA provide habitat for forest interior species including wood thrush and Louisiana waterthrush that require large tracts of mature forest to maintain viable populations. As forests become fragmented in the landscape, decreased food availability and increased predation and nest parasitism impact forest interior species reproductive success (Wilcove 1985, Brittingham and Goodrich 2010, Richmond et al. 2011, Hagan et al. 2012, Burke and Nol 1998, 2000)

The Maromas CFA also provides a connection between two undeveloped forest corridors located in the Lower Connecticut River and, further north, along the Bolton Range. These corridors have been recognized for their lack of development, and their importance to neotropical migrants. The Bolten Range corridor extends into Massachusetts, and provides forest bird nesting habitat. It is important, therefore, to restore the fragmentation that agricultural land is creating within the Maromas CFA, and maintain the contiguous forest core that is uncommon in the landscape, and provides important wildlife habitat.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- As new pasture, hay, and/or grassland habitat is acquired, evaluate its ecological importance to determine if it should be maintained or if it should restored to native forest through tree plantings or natural succession.

**Sub-objective 1.2b. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Maromas River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is limited. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Connecticut in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Maromas CFA and Connecticut River to benefit priority refuge resources of concern including American shad, shortnose sturgeon, American eel, alewife, blueback herring, and Atlantic salmon, as well as other species of conservation concern such as sea lamprey.

***Rationale:***
The Maromas CFA is located along the Connecticut River which provides important habitat for American shad, shortnose sturgeon, American eel, alewife, blueback herring and Atlantic salmon. The Connecticut River is important migratory habitat for Atlantic salmon, American shad, and shortnose sturgeon (a federally listed species), and spawning habitat for river herring. This area of the Connecticut River is also important as overwintering habitat for shortnose sturgeon.

American eel spend the majority of their young life in freshwater systems. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems, their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

Restoring and maintaining the ecological integrity of upland and wetland habitats of the CFA will have positive impacts on water quality of the Connecticut River, and other aquatic systems in the CFA. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 10 years of approval:*

- Work with partners to protect and increase "hard bottom" (e.g., gravel, cobble, or bedrock) for spawning aquatic species.
- Work with partners to reduce combined sewer overflow.

**Inventory and Monitoring Strategies:**
*Within 5 years of approval:*

- Work with partners to conduct stream assessments to evaluate stream and fish community health.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Maromas Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Maromas Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Maromas Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Maromas Division as an outdoor classroom.
- As part of Service's Urban Refuge Initiative seek opportunities to work with partners to connect audiences from the Middletown area to nature (e.g., using WoW Express, Adopt-a-Habitat).

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Maromas Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Maromas Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Maromas Division's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Maromas Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Maromas Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Maromas Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Maromas Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
The Maromas CFA is mostly comprised of floodplain forests along the Connecticut River, and upland forests and wetlands west of the river. This area offers good hunting opportunities for small game, waterfowl, turkey, and white-tailed deer. There is a history of public hunting within the bounds of the CFA at Cockaponset State Forest and Millers Pond State Park. Additional hunting is likely allowed via landowner permission in other parts of the CFA. Hunting, consistent with the final compatibility determination, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions to support a safe, manageable hunt program.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use at the division.)

*Within 1 year of acquiring land sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at the Maromas Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.
- Offer to host hunter education field courses.
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Maromas Division after completing all administrative procedures to officially open refuge lands to fishing, based on Connecticut Department of Energy and Environmental Protection regulations, and division-specific conditions, if necessary.

***Rationale:***
The principal fishing resources on this CFA are the Connecticut River, several small reservoirs and associated streams (i.e. Hubbard Brook and Reservoir Brook) that support game fish. Most people fish the Connecticut River from boats, but allowing bank fishing on a Maromas Division would provide the public with another recreational opportunity. Fishing is a popular activity in this area and would continue under Service ownership, consistent with the final compatibility determination. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- The Maromas Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.

*Within 5 years of acquiring land with fishable waters:*
- Work with the Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*
- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity. Opening acquired land in this new division to wildlife observation and photography will provide visitors a chance to see and photography a variety of wildlife species in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses at the division.)

*Within 1 year of acquiring land:*
- Consistent with the final compatibility determination, allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
By providing new visitors a quality experience they are more likely to return and share their experiences with others. Enhancing the opportunities for visitors to view and photograph wildlife will give them a better appreciation of the refuge, Refuge System and Service. One way to accomplish this is to offer sufficient information and aids to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses at the division.)

*Within 1 year of acquiring land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats, and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge visitor services plan.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Maromas Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Maromas Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that are part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Maromas Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that a particular use is compatible.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Allow canoeing and kayaking in acquired coves and waterways.

*Within 5 years of CCP approval:*

- Work with friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Pyquag Conservation Focus Area (Proposed)

## East Hartford, Wethersfield, Glastonbury, and Rocky Hill, Connecticut

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 2,956 | 79.6 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *2,956* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 756 | 20.4 % |
| Total Acres in CFA[2, 4] | 3,712 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

Pyquag was a SFA in the 1995 Conte FEIS. The Pyquag CFA area is considered important floodplain forest by The Nature Conservancy and the proposed CFA would allow for the restoration and conservation of the floodplain forest and associated wetland complex. Habitat conservation in this CFA will help allow for the landward migration of the coastal wetland complex (salt-, brackish-, and freshwater tidally influenced wetlands) due to climate change.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Pasture/Hay/Grassland – 29.3%
- Hardwood Swamp – 19.8%
- Freshwater Marsh – 6.2%

For more information on the habitats in the CFA, see map A.8 and table A.6.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.7 below, there are seven priority refuge resources of concern (PRRC) aquatic and terrestrial species that rely upon the open water and wetland habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. This includes floodplain habitats which have undergone significant alteration within the Connecticut River watershed. The refuge will seek to protect and restore (if necessary) these, and other PRRC habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and migratory birds. These species and habitats are discussed further below.

1. **Federal Threatened and Endangered Species**
   This section of the Connecticut River is important migratory and overwintering habitat for the federally listed shortnose sturgeon. American eel, a species petitioned for federal listing, also occurs in the freshwater systems of this CFA. Eels enter the Connecticut River as juveniles, and migrate upstream to feed in aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Pyquag CFA is situated on the Connecticut River, and the forested habitats and wetlands provide very important stopover habitat for landbirds, shorebirds, and waterbirds.

3. **Waterfowl**
   The freshwater marshes, hardwood swamps, and open water of the Connecticut River provide important stopover areas for migrating and wintering waterfowl. Large concentrations of American black duck (a PRRC species), green-winged teal, and mallard use habitats in this CFA. Other species include Canada geese, bufflehead, canvasback, wood duck, northern pintail, gadwall, and mergansers.

4. **Diadromous fish and other aquatic species**
   The Pyquag CFA straddles the Connecticut River which provides important habitat for PRRC species including American shad, shortnose sturgeon, American eel, alewife, blueback herring and Atlantic salmon. Shortnose sturgeon is also a federally listed species, and American eel has been petitioned for listing under the ESA. Keeney and Wethersfield Coves, located in past river channels, and Crow Point (a borrow pit for I-91) are accessible from the Connecticut River and provide additional open water habitat for these species. There are also various brooks that feed into the Connecticut River and Coves that are important for river herring. Sea lamprey, another species of conservation concern, occurs in this CFA providing important ecological benefits to aquatic systems.

5. **Wetlands**
   More commonly known locally as the Great Meadows, this proposed division lies in a large floodplain (4,310 acres) in Wethersfield, Glastonbury and Rocky Hill plus a small portion of East Hartford (Keeney Cove). The floodplain is roughly 5 miles long and about 2 ½ miles wide. It is 4 to 5 feet above the normal river level, while the terraces where the towns are located are 20 to 30 feet above the river. Annual spring floods generally rise 10 to 15 higher than the normal river level, and flood about 2,740 acres. Although currently almost entirely in agricultural use, the floodplain would naturally support a forest of silver maple, cottonwood, sycamore, box elder and willow. A couple of floodplain forests are ranked as exemplary by the State natural heritage program.

   Where older channels of the river occur, there are several marsh types present, varying from cattail marsh to shrub marsh. Several of the freshwater tidal marshes are ranked as exemplary by the State natural heritage program. The unusual plants green dragon and the golden club (State species of special concern) are both found in wetlands here.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

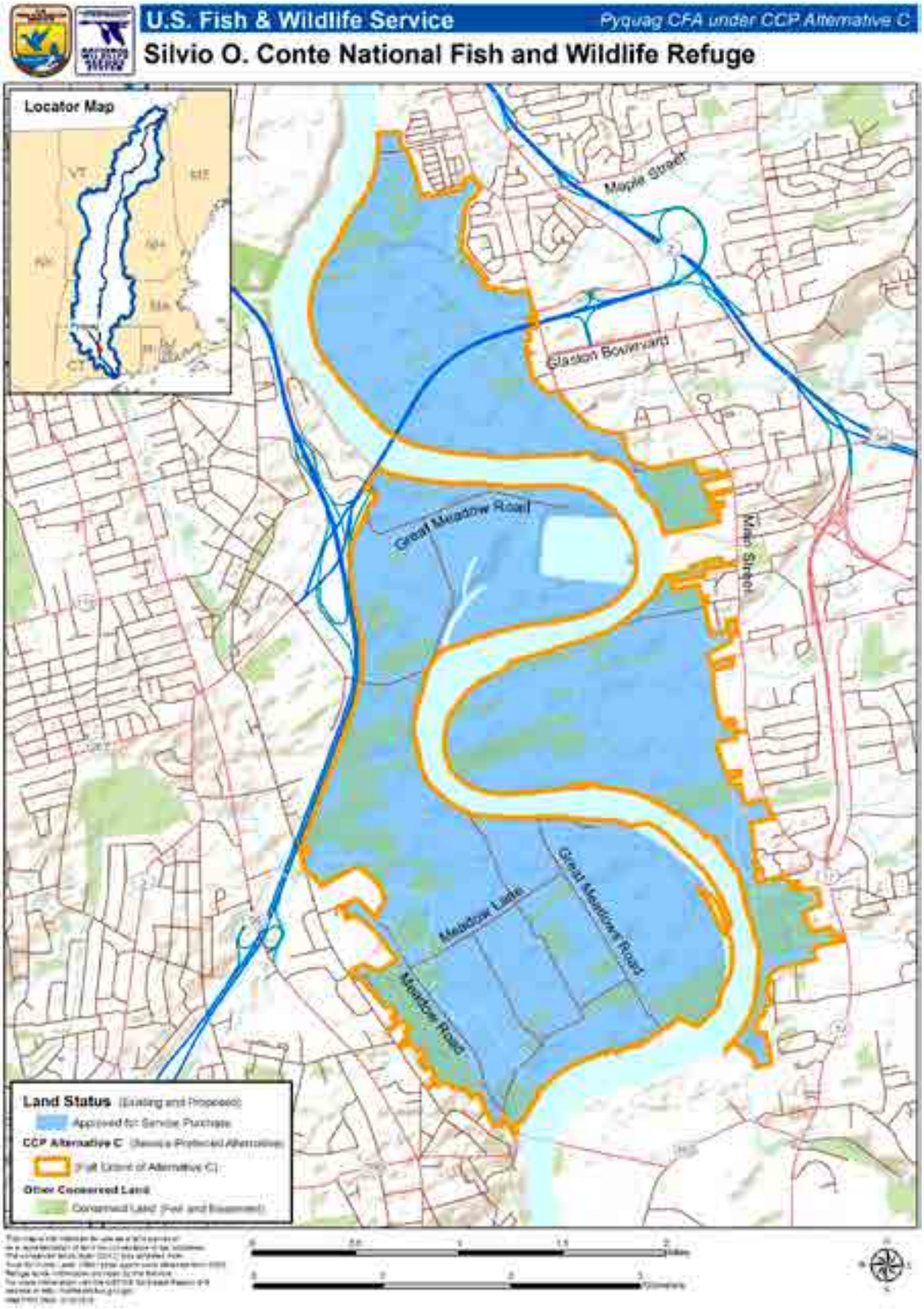
- Forest management activities will focus on restoration of degraded floodplains, including where appropriate, restoring the primary natural disturbance mechanism (seasonal flooding) and species composition and structure to accepted historical conditions. Management of upland forests will improve structural diversity and species composition will be appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Non-forest management activities will occur within the emergent wetland habitats, and will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- Open water (stream, rivers, and coves) will focus on maintaining stream connectivity, including connectivity between the coves and the Connecticut River, and providing outstanding water quality.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, interpretation, and environmental education.

*Map A.7. Pyquag CFA – Location.*



*Map A.8. Pyquag CFA – Habitat Types.*

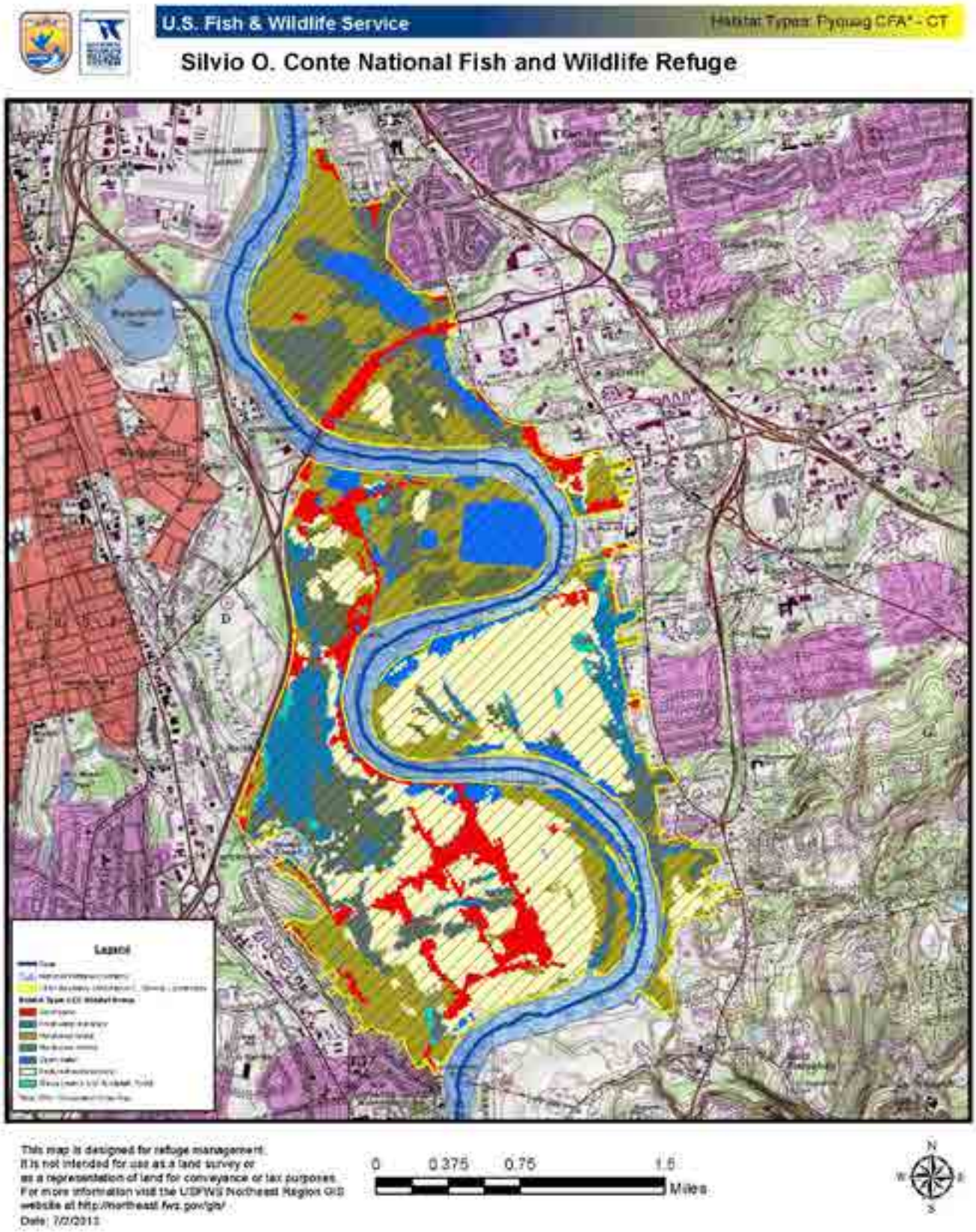


**Table A.6. Pyquag CFA – Habitat Types.**

| LCC General Habitat Type[1] | CFA[2] | | | |
|---|---|---|---|---|
| | Total Acres | Conserved by Others[3] | USFWS Owned[4] | Percent CFA[5] |
| **Forested Uplands and Wetlands[6]** | | | | |
| Hardwood forest | 933 | 223 | 0 | 25.2% |
| Hardwood swamp | 734 | 141 | 0 | 19.8% |
| Shrub swamp and floodplain forest | 32 | 9 | 0 | 0.9% |
| *Forested uplands and wetlands subtotal* | *1,699* | *372* | *0* | *45.8%* |
| **Non-forested Uplands and Wetlands[6]** | | | | |
| Freshwater marshes | 229 | 99 | 0 | 6.2% |
| Pasture/hay/grassland | 1,085 | 163 | 0 | 29.3% |
| *Non-forested uplands and wetlands subtotal* | *1,314* | *262* | *0* | *35.4%* |
| **Inland aquatic habitats[6]** | | | | |
| Open Water | 329 | 45 | 0 | 8.9% |
| *Inland aquatic habitats subtotal* | *329* | *45* | *0* | *8.9%* |
| **Other** | | | | |
| Developed | 367 | 76 | 0 | 9.9% |
| *Other subtotal* | *367* | *76* | *0* | *9.9%* |
| **TOTAL** | **3,709** | **755** | **0** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Focus Area; representing Service - preferred Alternative C

3- Acres in the CFA currently conserved by others (TNC 2012)

4 - Acres in the CFA currently owned by the USFWS

5 - Percentage of the CFA represented by the habitat type

6 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.7. Pyquag CFA – Preliminary Priority Refuge Resources of Concern**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 933 acres** | | |
| Appalachian (hemlock)-northern hardwood forest[H]<br><br>Northeastern interior dry-mesic oak forest[H] | Northern hardwoods such as sugar maple, yellow birch, and American beech are characteristic of the *Appalachian (hemlock)-northern hardwood forest,* either forming a deciduous canopy or mixed with eastern hemlock (or in some cases white pine ). Other common and sometimes dominant trees include Oak spp. (most commonly red oak, tulip poplar, black cherry, and black birch. *Northeastern interior dry-mesic oak forests* are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. Soils are acidic and relatively infertile but not strongly drought prone. Oak species characteristic of dry-mesic conditions (e.g., red oak, white oak, black oak, and scarlet oak and hickory are dominant in mature stands. Chestnut oak may be present but is generally less important than the other oak species. American chestnut was a prominent tree before chestnut blight eradicated it as a canopy constituent. Red maple, black birch, and yellow birch may be common associates. With a long history of human habitation, many of the forests are early in their development following disturbance, where White pine, Virginia pine, or tulip poplar may be a dominant or codominant presence. On hills and slopes within these forests, pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with red maple, swamp white oak, or black tupelo characteristic (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Swamp[5] - 734 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-central interior wet flatwoods[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. The acidic substrate is mineral soil, often with a component of organic muck (organic matter 20 to 65 percent); if peat (greater than 65 percent organic material) is present, it usually forms an organic top soil horizon over mineral soil rather than a true peat substrate. Eastern hemlock 1s usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-central interior wet flatwoods* usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, akeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. Pin oak typically dominates and is often associated with swamp white oak and Red maple. American sweetgum and black tupelo are also common associates. Understory herbaceous and shrub species present in examples of this system can vary. Some common species include sedges, cinnamon fern, common buttonbush, alder, and holly (Gawler 2008). | Migratory species |
| **Shrub Swamp and Floodplain Forest[5] - 32 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Northern Harrier[I,J]<br>Wood Duck[A,I,J]<br>Green-winged Teal[A,I ,J]<br>Snowy Egret[A,I,J]<br>Rusty Blackbird[A]<br>**American Bittern[A,I]**<br>Common Merganser[I]<br>Bufflehead[A]<br>Canada Goose, NAP[A,J]<br>Canada Goose, AP[A,J]<br>**Virginia Rail[I]**<br>**Marsh Wren[A,I]**<br>Mallard[A,I,J]<br>Davis' Sedge[I]<br>Waputo[I]<br>Gray Catbird[A,I,J]<br>**Willow Flycatcher[A, I]**<br>**Warbling Vireo[I]**<br>**Spotted Turtle[I]**<br>Eastern Kingbird[A,I,J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 229 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Northern Harrier[I,J]<br>Wood Duck[A,I,J]<br>Green-winged Teal[A,I ,J]<br>Snowy Egret[A,I,J]<br>Rusty Blackbird[A]<br>**American Bittern[A,I]**<br>Common Merganser[I]<br>Bufflehead[A]<br>Canada Goose, NAP[A,J]<br>Canada Goose, AP[A,J]<br>**Virginia Rail[I]**<br>**Marsh Wren[A,I]**<br>Mallard[A,I,J]<br>Davis' Sedge[I]<br>Waputo[I]<br>Gray Catbird[A,I,J]<br>**Willow Flycatcher[A, I]**<br>**Warbling Vireo[I]**<br>**Spotted Turtle[I]**<br>Eastern Kingbird[A,I,J] |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland[5] – 1,085 acres** | | |
| Where appropriate and supported by the local community, restore to floodplain forest | *Laurentian-Acadian floodplain forest* occur along medium to large rivers, and include a matrix of upland and wetland habitats. Floodplain forests, with silver maple are characteristic, as well as herbaceous sloughs and shrub wetlands. Most areas are underwater each spring; micro-topography determines how long the various habitats are inundated. Associated trees include red maple and American hornbeam, the latter frequent but never abundant. On terraces or in more calcium rich areas, sugar maple or red oak may be locally prominent, with yellow birch and ash, black willow is characteristic of the levees adjacent to the channel. Common shrubs include silky dogwood and viburnum. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern-dominated understory in many areas by mid-summer. Non-forested wetlands associated with these systems include shrub-dominated and grass-non-woody vegetation (Gawler 2008). | Migratory Species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 329 acres** | | |
| American Eel[E, F] | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Smallmouth Bass[I]<br>Burbot[I]<br>Striped Bass[I]<br>Pumpkinseed[I]<br>Sea Lamprey[I]<br>Longnose Dace[I]<br>Yellow Perch[I] |
| Shortnose Sturgeon[B, D, F, G] | Spawn in slow-moving, 48 F water of large rivers, and feed in fresh and brackish water along the river bottom (USFWS 1996). | |
| Alewife[B, F, G] | Spawn in ponds and slow-moving streams (USFWS 1996). | |
| Atlantic Salmon[B, F, G] | Spawn in cold freshwater moving streams w/coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |
| Blueback Herring[F, G] | Spawn in fast moving, shallow water when the river temperature is about 58 F (USFWS 1996). | |
| American Shad[B, F, G] | Spawn when the water temperature is above 60° F in shoal area of river and lower reaches of larger tributaries (USFWS 1996). | |
| American Black Duck[A, B, C, G] | Migrating habitat includes open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging (DeGraaf et al. 2001). | Canada Goose, Atlantic[A]<br>Canada Goose, North Atlantic[A]<br>**Bufflehead[A]**<br>Mallard[A]<br>Snowy Egret[A,I,J]<br>Bald Eagle[A,I]<br>Wood Duck[A]<br>Green-winged Teal[A] |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Objectives and Strategies for Refuge Lands in the Pyquag CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
We envision healthy forests within the Pyquag CFA where a diverse seral structure provides suitable habitat conditions for a suite of Connecticut wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010).

Pyquag CFA hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is certainly available within the CFA. To date our review of the Pyquag CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Pyquag comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Pyquag are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and where appropriate, move succession forward to emulate later seral stage characteristics.

Migrating landbirds are typically unable to deposit sufficient fat stores to fly nonstop between breeding and nonbreeding areas (Blem 1980) and must use stopover habitats for feeding and resting before continuing migration. Studies have shown migrating birds exhibit selective use of some habitats over others (Moore et al. 1990, Petit 2000, Rodewald et al. 2004). In general, taller, more structurally diverse vegetation types within an area appear to support greater numbers of migrating birds than do habitats of lower stature and complexity (Moore et al. 1990, Noss 1991). Clearly, structurally complex habitats will not be suitable for all migratory species, but our conservation goal is to provide those areas used most frequently by migrating birds, suggesting relatively tall, structurally diverse habitats may best serve this purpose. The plasticity in habitat use exhibited by most species during migration (Moore et al. 1990, Petit 2000) suggests that many species are able to effectively use the food resources and cover afforded by structurally complex habitats. While our management goals may create a relatively old forest, hardwood forests within Pyquag will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of foraging opportunities. Patches of mature edge-dominated (i.e. forest-agricultural edge

and suburban forest of the type within Pyquag) and shrub-sapling stage forests were used most frequently by fall stopover migrants in a Pennsylvania study (Rodewald et al. 2004).

In a mature forest, many migrating bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Hardwood forests within Pyquag should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of foraging opportunities. Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral shrub-sapling habitat rich in fruits and insects important to migrating birds (Noss 1991, DeGraaf et al. 2006). Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney et al. 2004, Côté et al. 2004, see also Rawinski 2008).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners, including the State of Connecticut, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

**Sub-objective 1.1a. (Hardwood Swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
Occurrences of hardwood swamps within the Pyquag Conservation Focus Area (CFA) represent a number of natural communities. Historically they have undergone significant alteration, and have great potential for restoration. Acidic hardwood swamps may be found in basins, or on gently sloping seepage lowlands within small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Eastern hemlock is often the dominant overstory species, and the organic substrate supports an important sphagnum (moss) layer.

Hardwood swamp occurrences within Pyquag with more alkaline soils are often found along riparian and floodplain areas in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the water table drives complexes of forest upland and wetland species including pin oak, red maple, swamp white oak, sweetgum, and blackgum. The examples identified within the Pyquag CFA occur within the floodplain of the Connecticut River.

These two systems do share a common disturbance history; agricultural practices, development pressures, and selective logging have largely removed these habitats from the landscape, or greatly simplified their historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats. Successional trends in hardwood swamps are not well understood. Our conservation efforts within the Pyquag will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for spring and fall migrant birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites shown to be important during the energy-intensive migration (Petit 2000).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State of Connecticut in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Map vernal pools and seeps.

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide breeding, foraging and stopover habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Our coarse-scale habitat analysis of this CFA identifies a wetland complex in South Wethersfield on the west side of the Connecticut River with a high percent of freshwater marsh interspersed with small pockets of shrub swamp. Please see sub-objective 1.2a for a detailed discussion on this wetland complex, freshwater marsh communities, and priority resource of concern.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Survey wildlife utilization of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marsh communities to support natural and rare ecological communities, and provide breeding, wintering and stopover habitat for priority refuge resources of concern including American black duck.

***Rationale:***
The freshwater marsh habitat within the Pyquag CFA occurs in past channels of the Connecticut River. These marshlands are within the active floodplain, and may be influenced by the tide. The largest contiguous acreage occurs in South Wethersfield on the east side of Interstate 91. It is part of a larger wetland complex that may provide breeding, foraging, and wintering habitat for American black duck, a species of conservation concern, as well as migratory stopover habitat for a variety of other waterfowl species. These freshwater marshes also provide important habitat for American bittern, sora rails, and least bittern. Two state plant species of special concern, green dragon and golden club also occur in the Pyquag CFA wetland habitats.

Flooding of this wetland complex during high water events provides a diversity of plant communities, and habitats for a variety of wildlife species. American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 30. Black ducks use wetlands, including shrub swamp and freshwater marsh communities, as stopover habitat during migration, and as breeding and wintering habitat. Well-concealed nests are placed on the ground in nearby uplands or hummocks in wetlands, and adults and their broods forage on seeds, aquatic vegetation, and invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). Open water habitat and the adjacent wetland complex provides excellent wintering and migrating habitat for American black ducks. And located on the Connecticut River, an important migration corridor, these wetland communities are used by other waterfowl species during migration including green-winged teal, common merganser, mallards, bufflehead and wood ducks.

The wetland complex is surrounded by development and agricultural land. Impacts may include altered hydrology, contamination, and non-native invasive plant species. A multi-scale wildlife habitat inventory will be necessary to determine the condition of all habitats in the CFA. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Encourage local landowners to use Connecticut Best Management Practices within active agricultural fields that are located along the perimeter of marsh habitats.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife use of existing wetlands.
- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Where appropriate, restore historic composition and structure, and improve the natural hydrology and landscape connectivity to support natural and rare ecological communities. Management will provide stopover habitat for migratory species.

***Rationale:***
Thirty percent of the Pyquag CFA is typed as pasture, hay, and grassland habitat. The majority of these habitats is in active agricultural use, and is located in floodplain of the Connecticut River. This large floodplain includes Keeny and Wethersfield Coves, and extends approximately 5 miles south along the winding Connecticut River. It is 4 to 5 feet above the normal river level, and annual spring floods generally rise 10 to 15 feet above, flooding approximately 2,740 acres. This floodplain is a natural flood storage area for the surrounding communities, and remnant patches are ranked as exemplary by the Connecticut Natural Heritage Program.

The topography and natural processes of floodplain systems result in the development of complex upland and wetland vegetation on generally flat topography, and soils deposited by the river. The Pyquag CFA has this diversity of habitats in areas not cleared for agricultural use. Hardwood forests and swamps, shrub swamps, and freshwater marsh are part of the floodplain. Silver maple is a characteristic species of a floodplain forest, as well as red maple, ash, red oak, and yellow birch. Common shrubs include black willow, silky dogwood and viburnums. The herbaceous layer within the forested portions of the floodplain, include spring ephemerals and ferns (Gawler 2008).

Restoration of this floodplain will provide a more contiguous and diverse breeding and migratory habitat for a variety of wildlife species. The Pyquag CFA is significant migration habitat as it straddles the Connecticut River, an important migratory corridor. A restored floodplain will also improve its function to retain and slow flood waters, reducing the extent of damage to the surrounding communities, and thereby improving water quality.

However, we also support the protection of high-value, productive agricultural lands identified by local communities and the State. It is not the refuge's intention to target these lands for acquisition. Instead, our priority would be to work with individual landowners, states, and other Federal agencies to protect these lands and ensure they continue to be part of the working landscape. There are many State and Federal programs that protect agricultural lands and help promote farming practices that benefit wildlife and help protect water quality. Through our private lands program, we will help direct landowners who are interested in these programs to the proper state and Federal agencies and programs. In rare cases, we may acquire agricultural lands from willing sellers, when other options to keep the land in agricultural production are not available, of if habitats for Federal trust resources are in jeopardy from development or other land use changes.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners and landowners to promote farming practices that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- As new pasture, hay, and/or grassland habitat is acquired, evaluate its ecological importance to determine if it should be maintained or if it should be restored to native forest through tree plantings or natural succession.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Pyquag CFA and Connecticut River to benefit priority refuge resources of concern including American shad, shortnose sturgeon, American eel, alewife, blueback herring, and Atlantic salmon, as well as other species of conservation concern such as sea lamprey.

***Rationale:***
The Pyquag CFA straddles the Connecticut River which provides important habitat for American shad, shortnose sturgeon, American eel, alewife blueback herring and Atlantic salmon. Keeney and Wethersfield Coves, located in past river channels, and Crow Point (a borrow pit for I-91) are accessible from the Connecticut River and provide additional open water habitat for these species. It is important, therefore, to maintain open channels to these coves for aquatic species passage. There are also various brooks that feed into the Connecticut River and Coves that are important for river herring. The Connecticut River is important migratory habitat for Atlantic salmon, American shad, and shortnose sturgeon (a federally listed species), and spawning habitat for river herring. This area of the Connecticut River is also important as overwintering habitat for shortnose sturgeon. American eel, a species petitioned for federal listing, also occurs in the freshwater systems of this CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems, their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

Restoring and maintaining the ecological integrity of upland and wetland habitats of the CFA will have positive impacts on water quality of the Connecticut River, and other aquatic systems in the CFA. Baseline information on the condition of the water resources, and associated upland and wetland habitats in the CFA will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to maintain open channels from the Connecticut River to open water coves.
- Work with adjacent landowners to eliminate barriers to aquatic species passage.

*Within 10 years of land acquisition and CCP approval:*

- Work with partners to protect and increase “hard bottom” (e.g., gravel, cobble, or bedrock) substrate for spawning aquatic species.
- Work with partners to reduce combined sewer overflow.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Pyquag Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Pyquag Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Pyquag Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Pyquag Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Pyquag Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Pyquag Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Pyquag Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Pyquag Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Pyquag Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.

- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Pyquag Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Pyquag Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
Hunting is allowed on national wildlife refuges, consistent with the final compatibility determination. The Pyquag CFA is comprised of floodplain forests and wetlands adjacent to the Connecticut River, offering good hunting opportunities for waterfowl, small game, and white-tailed deer. A public hunting area in close proximity to Hartford would be popular and would help the refuge connect with the sporting community. Hunting, if found to be a compatible use, will be allowed when the Service acquires land that can support hunt seasons. Retaining

hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions to support a safe, manageable hunt program.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Open newly acquired lands to hunting, if found to be compatible.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use.)

*Within 1 year of acquiring land sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Pyquag Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.
- Offer to host hunter education field courses.
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Pyquag Division after completing all administrative procedures to officially open refuge lands to fishing, based on Connecticut Department of Energy and Environmental Protection regulations.

***Rationale:***
Fishing would be allowed on a newly created division consistent with the final compatibility determination. The principal fishing resource on this CFA is the Connecticut River, although three small streams (i.e. Beaver Brook, Salmon Brook, and Hubbard Brook) flow through sections of the CFA. Most people fish the Connecticut River from boats, but allowing bank fishing on a Pyquag Division would provide the public with another recreational opportunity. Fishing is a popular activity throughout the river would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Pyquag Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land with fishable waters:*

- Work with the Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity. Opening acquired land in this new division to wildlife observation and photography will provide visitors a chance to see and photography a variety of wildlife species in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that these uses are compatible.)

*Within 1 year of acquiring land:*

- Consistent with the final compatibility determination, allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that these uses are compatible.

*Within 1 year of acquiring land:*
Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*
- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*
- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*
- Implement the visitor use enhancements identified in the public access strategy and the refuge visitor services plan.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Pyquag Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*
- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Pyquag Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Pyquag Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination these uses are appropriate and compatible.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Allow canoeing and kayaking in acquired coves and waterways.

*Within 5 years of CCP approval:*

Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Salmon Brook Conservation Focus Area (Proposed)

## Suffield, Granby, and East Granby, Connecticut

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 2,770 | 92.7 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *2,770* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 216 | 7.3 % |
| Total Acres in CFA[2, 4] | 2,986 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The proposed Salmon Brook CFA was identified by the State of Connecticut as a priority for grassland and early successional habitat restoration and management.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Swamp – 17.8%
- Pasture/Hay/Grassland – 34.1%
- Shrub Swamp and Floodplain Forest – 1.7%

For more information on habitats in the CFA, see map A.10 and table A.8.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.9 below, there are two priority refuge resources of concern (PRRC) aquatic species that rely upon the open water habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. This includes potential for a large tract of contiguous grasslands to benefit declining grassland dependent species, and floodplain, a habitat that has undergone significant alteration within the Connecticut River watershed. The refuge will seek to protect and restore (if necessary) these, and other PRRC habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and migratory landbirds. These species and habitats are discussed further below.

1. **Federal Threatened and Endangered Species**
   American eel, a species petitioned for federal listing, spend the majority of their young life in the freshwater systems of this CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem. Migrants are also known to use habitats beyond the Connecticut River main stem within the watershed, though in lower numbers (Smith College 2006). The Salmon Brook CFA is less than 10 miles from the Connecticut River and contains large tracts of hardwood swamps and riparian habitat. These habitats provide stopover areas for a diversity of species including wood thrush, Canada warbler, black-throated blue warbler, black-throated green warbler, red-eyed vireo, American redstart, and yellow-bellied sapsucker (Smith College 2006).

3. **Diadromous fish**
   The PRRC species for Salmon Brook CFA includes American eel, a species petitioned for federal listing, and brook trout. Mountain Brook, a tributary to the much larger Salmon Brook, meanders through the Salmon Brook CFA, providing habitat for brook trout and eel.

   Over thirty-four percent of the Salmon Brook CFA is in pasture, hay and grassland habitat, consisting mostly of large fields between 50 to almost 200 acres. Management of these fields as grassland habitat would benefit declining grassland bird species. Grasslands are a high priority habitat for the state of Connecticut. These habitats provide breeding and nesting habitat for several state threatened and endangered species, including northern harrier, upland sandpiper, barn owl, and grasshopper sparrow. Grasshopper sparrow historically nested in the Salmon Brook CFA, one is of the few remaining nesting locations for this species in Connecticut (Comins personal communication 2013). Many grassland birds are area sensitive, and require large grassland acres (greater than 25 acres or 10 hectares) including grasshopper sparrows, bobolinks, eastern meadowlarks, and upland sandpiper (Vickery et al. 1994). A contiguous block of grassland habitat in the Salmon Brook CFA will benefit these species, and provide a habitat that is increasingly rare in the region.

4. **Wetlands**
   Five-hundred and thirty acres of hardwood swamp and 51 acres of shrub-swamp and floodplain forest occur in the CFA. The majority of the acreage, and large contiguous patches, are adjacent and part of the Mountain Brook floodplain. Within the Connecticut River watershed agricultural practices and selective logging have largely removed floodplain habitat from the landscape, or greatly simplified its historic species composition. Floodplain habitat in the Salmon Brook CFA has undergone significant alteration and there is great potential for restoration. Intact floodplain forests in the Salmon Brook CFA will provide high-quality habitat for neo-tropical migratory birds, restore forest connectivity, and travel corridors for wildlife, and increase water quality and shade for aquatic species.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

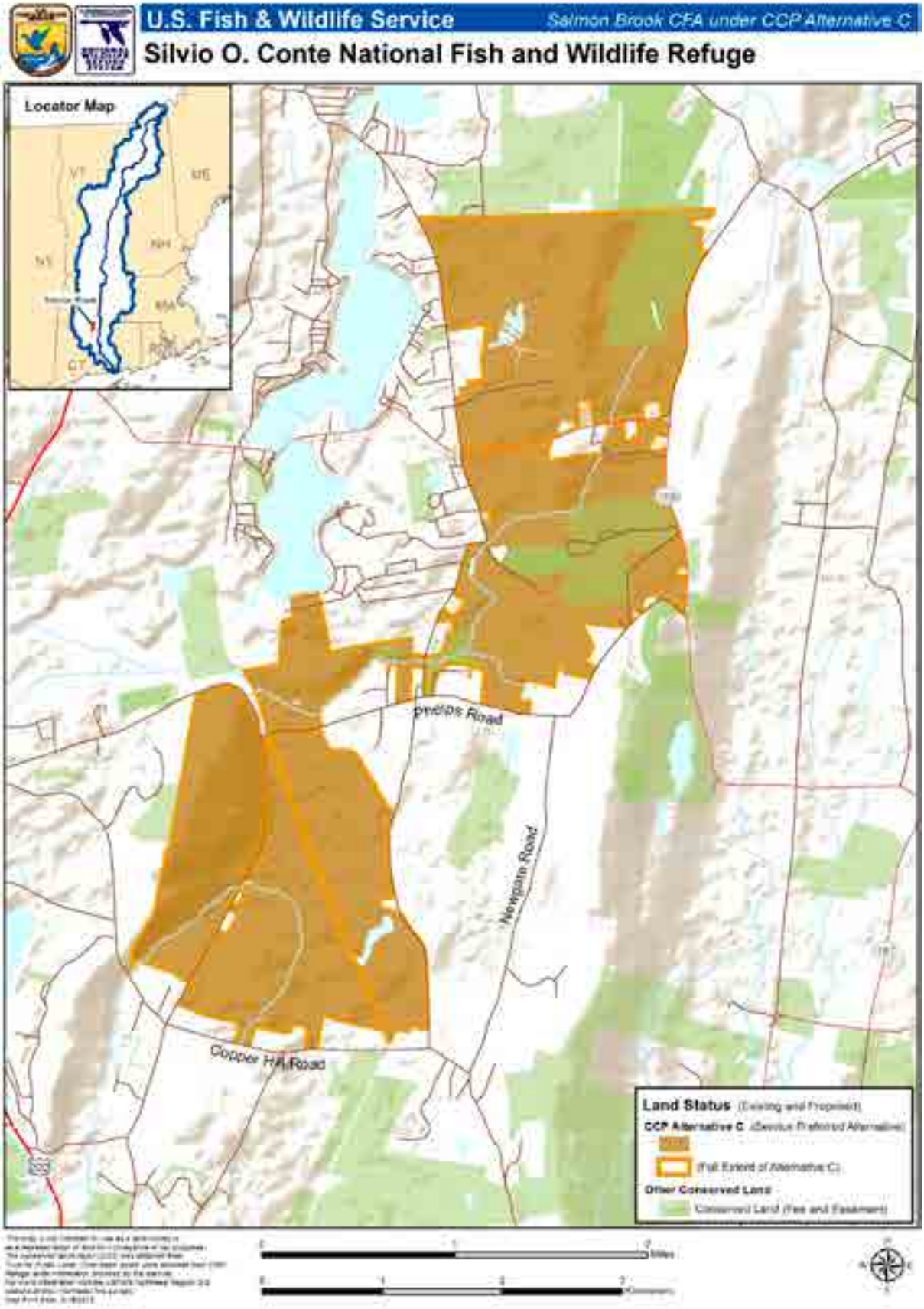
We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (ie. forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will focus on restoration of degraded floodplains, including (where appropriate) restoring the primary natural disturbance mechanism (seasonal flooding) and species composition and structure to accepted historical conditions. Management of upland forests will improve structural diversity, and emphasize species appropriate for site conditions and location.
- Where appropriate, we will maintain large contiguous acres of warm season grasses.
- Our management activities in emergent and shrub wetland habitats will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers, and ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

*Map A.9. Salmon Brook CFA – Location.*



*Map A.10. Farmington River CPA/Salmon Brook CFA – Habitat Types.*

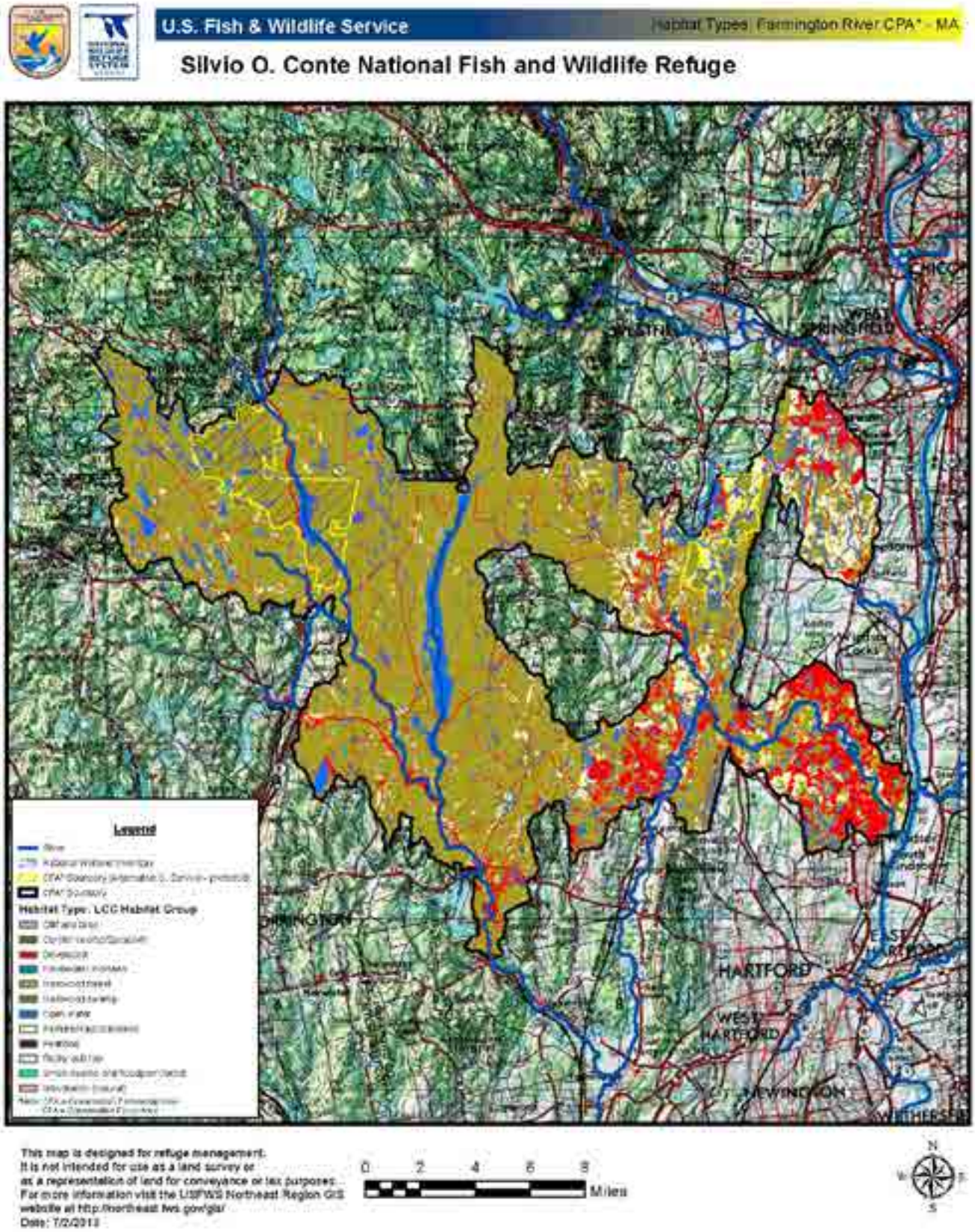


**Table A.8. Farmington River CPA/Salmon Brook CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 368 | 0.2% | 0 | 0 | 0 | 0.0% | 0.0% |
| Hardwood forest | 126,414 | 68.2% | 1,271 | 132 | 0 | 42.7% | 1.0% |
| Hardwood swamp | 8,355 | 4.5% | 530 | 52 | 0 | 17.8% | 6.3% |
| Shrub swamp and floodplain forest | 1,392 | 0.8% | 51 | 8 | 0 | 1.7% | 3.6% |
| Woodlands (natural) | 483 | 0.3% | 9 | 0 | 0 | 0.3% | 1.9% |
| *Forested uplands and wetlands subtotal* | *137,013* | *73.9%* | *1,862* | *192* | *0* | *62.5%* | *1.4%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 603 | 0.3% | 4 | 0 | 0 | 0.1% | 0.6% |
| Freshwater marshes | 804 | 0.4% | 5 | 0 | 0 | 0.2% | 0.6% |
| Pasture/hay/grassland | 16,907 | 9.1% | 1,015 | 20 | 0 | 34.1% | 6.0% |
| Peatland | 31 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky outcrop | 25 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *18,370* | *9.9%* | *1,023* | *20* | *0* | *34.3%* | *5.6%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 6,498 | 3.5% | 6 | 0 | 0 | 0.2% | 0.1% |
| *Inland aquatic habitats subtotal* | *6,498* | *3.5%* | *6* | *0* | *0* | *0.2%* | *0.1%* |
| **Other** | | | | | | | |
| Developed | 23,550 | 12.7% | 89 | 3 | 0 | 3.0% | 0.4% |
| *Other subtotal* | *23,550* | *12.7%* | *89* | *3* | *0* | *3.0%* | *0.4%* |
| **TOTAL** | **185,430** | **100.0%** | **2,980** | **216** | **0** | **100.0%** | **1.6%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.9. Salmon Brook CFA – Potential Priority Refuge Resources of Concern**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 1,271 acres** | | |
| Appalachian (hemlock)-northern hardwood forest[H]<br><br>Northeastern interior dry-mesic oak forest[H]<br><br>Central Appalachian dry oak-pine forest[H] | Northern hardwoods such as sugar maple, yellow birch, and American beech are characteristic of the *Appalachian (hemlock)-northern hardwood forest,* either forming a deciduous canopy or mixed with eastern hemlock (or in some cases white pine). Other common and sometimes dominant trees include Oak spp. (most commonly red oak, tulip poplar, black cherry, and black birch. *Northeastern interior dry-mesic oak forests* are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. Soils are acidic and relatively infertile but not strongly drought prone. Oak species characteristic of dry-mesic conditions (e.g., red oak, white oak, black oak, and scarlet oak and hickory are dominant in mature stands. Chestnut oak may be present but is generally less important than the other oak species. American chestnut was a prominent tree before chestnut blight eradicated it as a canopy constituent. Red maple, black birch, and yellow birch may be common associates. With a long history of human habitation, many of the forests are early in their development following disturbance, where White pine, Virginia pine, or tulip poplar may be a dominant or codominant presence. On hills and slopes within these forests, pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with red maple, swamp white oak, or black tupelo characteristic. The soils in the *Central Appalachian dry oak-pine forest* are coarse and infertile. The forest is mostly closed-canopy but can include more open woodlands. It is dominated by a variable mixture of dry-site oak and pine species, most typically chestnut oak, Virginia pine and white pine. The system may include areas of oak forest, pine forest (usually small), and mixed oak-pine forest. Heath shrubs such as Blue Ridge blueberry, black huckleberry, and mountain laurel are common in the understory and often form a dense layer (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Swamp[5] - 530 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-Central Interior and Appalachian rich swamp[H] | Eastern hemlock is usually present and may be dominant in the *North-Central Appalachian acidic swamp system*. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-Central Interior and Appalachian rich swamps* are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include red maple, black ash (*Fraxinus nigra*), as well as calcium loving (calciphilic) herbs. Conifers include American larch, but typically not Northern white cedar, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development (Gawler 2008). | Migratory species |
| **Shrub Swamp and Floodplain Forest[5] - 51 acres** | | |
| Laurentian-Acadian wet meadow-shrub swamp[H] | This system encompasses shrub swamps and wet meadows on mineral soils and are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and grass dominance; typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Trees are generally absent and, if present, are scattered (Gawler 2008). | Migratory species |
| **Woodlands (natural)[5] - 9 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 5 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Pasture/Hay/Grassland[5] – 1,015 acres** | | |
| Where appropriate, maintain as contiguous block of grassland habitat | Grasslands include fields managed for warm season grasses, such as switch grass, Indian grass, and blue stem, hayfields/pastures that are intensively managed for cool season grasses and active pastures. | American Woodcock[A, I, J]<br>**Bobolink[A,I]**<br>**Upland Sandpiper[A, I]**<br>Northern Harrier[I, J]<br>**Grasshopper Sparrow[I]**<br>**Eastern Meadowlark[I]**<br>Field Sparrow[A,I]<br>Eastern Kingbird[A,I]<br>American Kestrel[I] |
| **Cliff and Talus[5] – 4 acres** | | |
| North-central Appalachian circumneutral cliff and talus[H] | This cliff system occurs at low to mid elevations and consists of vertical or near-vertical cliffs and steep rocky slopes. Substrates include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern (Gawler 2008) . | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 6 acres** | | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Riverine Clubtail[I]<br>Skillet Clubtail[I]<br>Longnose Dace[I]<br>Cobra Clubtail[I] |
| **Brook Trout[F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH).

Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Salmon Brook CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
We envision healthy forests within the Salmon Brook CFA where a diverse seral structure provides suitable habitat conditions for a suite of wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010).

Salmon Brook CFA hardwood forests provide a diversity of habitats for wildlife. To date our review of the Salmon Brook CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Salmon Brook comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Salmon Brook are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and where appropriate, move succession forward to emulate later seral stage characteristics.

Migrating landbirds are typically unable to deposit sufficient fat stores to fly nonstop between breeding and nonbreeding areas (Blem 1980) and must use stopover habitats for feeding and resting before continuing migration. Studies have shown migrating birds exhibit selective use of some habitats over others (Moore et al. 1990, Petit 2000, Rodewald et al. 2004). In general, taller, more structurally diverse vegetation types within an area appear to support greater numbers of migrating birds than do habitats of lower stature and complexity (Moore et al. 1990, Noss 1991). Clearly, structurally complex habitats will not be suitable for all migratory species, but our conservation goal is to provide those areas used most frequently by migrating birds, suggesting relatively tall, structurally diverse habitats may best serve this purpose. The plasticity in habitat use exhibited by most species during migration (Moore et al. 1990, Petit 2000) suggests that many species are able to effectively use the food resources and cover afforded by structurally complex habitats. While our management goals may create a relatively old forest, hardwood forests within Salmon Brook will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of foraging opportunities. Patches of mature edge-dominated (i.e. forest-agricultural edge and suburban forest of the type within Salmon Brook) and shrub-sapling stage forests were used most frequently by fall stopover migrants in a Pennsylvania study (Rodewald et al. 2004).

In a mature forest, many migrating bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Salmon Brook's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of foraging opportunities. Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral shrub-sapling habitat rich in fruits and insects important to migrating birds (Noss 1991, DeGraaf et al. 2006). Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, Rawinski 2008).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map vernal pools and seeps.

- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1b. (Hardwood swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
Occurrences of hardwood swamps within the Salmon Brook CFA represent a number of natural communities. Historically they have undergone significant alteration, and have great potential for restoration. Acidic hardwood swamps may be found in basins, or on gently sloping seepage lowlands within small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Eastern hemlock is often the dominant overstory species, and the organic substrate supports an important sphagnum (moss) layer. Within the Connecticut River watershed, including the CFA, agricultural practices, development pressure, and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within the Salmon Brook will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for spring and fall migrant birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites shown to be important during the energy-intensive migration (Petit 2000).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map vernal pools and seeps.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Restore native species composition and structure, and improve the natural hydrology, as needed, to support natural and rare shrub swamp and floodplain forest ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
The shrub swamps in the Salmon Brook CFA are restricted to poorly drained areas and small seepage zones along Hungary and Mountain Brooks. These shrub swamp systems usually have a patchwork of shrub and grass dominance, and may include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). Based on our coarse-scale habitat analysis, the shrub swamps are also adjacent to agricultural land, and impacts to the wetland hydrology may be factor. Water pollution and invasive species introductions are also threats for shrub swamp communities.

Restoration of shrub swamp communities, as well as the surrounding forested habitat, will create high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Salmon Brook CFA is situated near the Connecticut River, and can provide significant stopover habitat for migrants in the spring and fall. Neo-tropical migrants typically use similar habitats during migration as they do during the breeding season (Petit 2000). Species such as gray catbird, yellow-rumped warbler, white-eyed vireo, eastern phoebe, eastern kingbird and common yellowthroat will use shrubland communities (McCann et al. 1993). Native shrubs will provide migrants with soft mast and abundant insects to replenish fat reserves, and structure to provide rest and adequate cover from predators and inclement weather.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy

suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Salmon Brook CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003)with different authors measuring fragmentation in different ways and, as a consequence, drawing different conclusions regarding both the magnitude and direction of its effects. Habitat fragmentation is usually defined as a landscape-scale process involving both habitat loss and the breaking apart of habitat. Results of empirical studies of habitat fragmentation are often difficult to interpret because (a. Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Pasture/Hay/Grassland)**
Where appropriate, maintain a contiguous block of grassland habitat for breeding and migrating grassland bird species; areas not managed for grassland birds will be allowed to revert to natural conditions.

***Rationale:***
Over 34 percent of the Salmon Brook CFA is typed as pasture, hay, and grassland, consisting mostly of large fields between 50 to almost 200 acres. Management of these fields as grassland habitat would benefit declining grassland bird species, and provide a habitat that is increasingly rare in the region.

Native grasslands were once more widespread in North America. A deterioration of rangelands, the conversion of prairies to agriculture, and afforestation of the eastern United States are significant factors to the decline of grassland bird populations. During European settlement, millions of acres of forests were cleared for agriculture in the eastern U.S., creating habitat for grassland dependent birds. As agricultural activities declined, open areas dominated by herbaceous vegetation began to convert back to forests, causing a drastic decline in grassland species in the region (Brennan and Kuvlesky Jr. 2005).

In fact, several grassland species are listed as threatened or endangered by the state of Connecticut, including northern harrier, upland sandpiper, barn owl, and grasshopper sparrow. Grasslands are a high priority habitat for the state, and maintaining large, contiguous acres of warm season grasses at the Salmon Brook CFA would benefit these species.

We also support the protection of high-value, productive agricultural lands identified by local communities and the State. It is not the refuge's intention to target these lands for acquisition. Instead, our priority would be to work with individual landowners, states, and other Federal agencies to protect these lands and ensure they continue to be part of the working landscape. There are many State and Federal programs that protect agricultural lands and help promote farming practices that benefit wildlife and help protect water quality. Through our private lands program, we will help direct landowners who are interested in these programs to the proper state and Federal agencies and programs. In rare cases, we may acquire agricultural lands from willing sellers, when other options to keep the land in agricultural production are not available, or if habitats for Federal trust resources are in jeopardy from development or other land use changes.

Due to our unfamiliarity with the habitat conditions in the CFA, a comprehensive, multi-scale habitat and wildlife inventory will be necessary to implement refuge strategies. This inventory will need to encompass all habitats within the CFA and associated landscape. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners and landowners to promote farming practices (ie. haying and pastured animals) that benefit grassland birds.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Assess the condition of pasture, hay and grassland habitats, as well as the overall size and location in the CFA, and proximity to other forest openings, to inform more detailed management strategies in an HMP.

**Sub-objective 1.2b. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the watershed.

***Rationale:***
See rationale for sub-objective 1.1d.

Habitats that occur within the Salmon Brook CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003)with different authors measuring fragmentation in different ways and, as a consequence, drawing different conclusions regarding both the magnitude and direction of its effects. Habitat fragmentation is usually defined as a landscape-scale process involving both habitat loss and the breaking apart of habitat. Results of empirical studies of habitat fragmentation are often difficult to interpret because (a. Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and American eel.

***Rationale:***
Mountain Brook meanders through the agricultural lands of the Salmon Brook CFA. Mountain Brook is a tributary to the much larger Salmon Brook, a tributary of the Connecticut River. There are few migration barriers along the Salmon Brook, which supports native brook trout, and spawning river herring at its mouth (outside the CFA boundary). Mountain Brook is a cold water stream that provides habitat for brook trout and American eel. Eastern brook trout is a state and refuge species of conservation concern, and American eel is petitioned for listing under the Endangered Species Act.

The naturally reproducing Eastern brook trout populations in Mountain Brook are sensitive to extreme temperature fluctuations, and require water temperatures between 40 to 70 degrees Fahrenheit for spawning, growth, and survival. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds, including those found in the Salmon Brook CFA. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Improving water quality and native fish habitat within the Salmon Brook CFA will require a comprehensive, multi-scale habitat and wildlife inventory. Due to our lack of knowledge regarding habitat conditions in this CFA, this inventory will need to encompass all habitats within the CFA and associated landscape. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Conduct stream assessments to evaluate stream and fish community health.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Salmon Brook Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Salmon Brook Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Salmon Brook Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Salmon Brook Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Salmon Brook Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Salmon Brook Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Salmon Brook Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Salmon Brook Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.

- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*
- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Salmon Brook Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*
- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state-of-the-art as well as traditional media e.g. pamphlets, signs, etc.

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Salmon Brook Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Salmon Brook Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
The Salmon Brook CFA is a popular area to hunt. Currently, public hunting for small game and white-tailed deer (archery only) is available on the Newgate Wildlife Management Area in East Granby. Hunting would be allowed on a newly created division consistent with the final compatibility determination. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions to support a safe, manageable hunt program.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Salmon Brook Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Salmon Brook Division after completing all administrative procedures to officially open refuge lands to fishing, based on Connecticut Department of Energy and Environmental Protection regulations, and Division-specific conditions, if necessary.

***Rationale:***
There are several streams in the proposed CFA including Salmon Brook, East Branch Salmon Brook, Muddy Brook, and Holcomb Brook. These rivers support cold water fisheries that include Eastern brook trout. A variety of other game fish are found in streams and ponds within the CFA. Fishing is a popular activity throughout this area and would continue under Service ownership, consistent with the final compatibility determination. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The Salmon Brook Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land:*

- Produce a brochure that highlights fishing opportunities for distribution at a division kiosk and the refuge website.
- Work with the Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that fishing is a compatible use.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the division.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exceptions listed for hunters and anglers. The refuge manager may issue a special use permit for public uses during the closed hours.
- Install an informational kiosk to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses.)

*Within 1 year of acquiring land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools, groups, and environmental organizations to include wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Salmon Brook Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Salmon Brook Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Examples include the Metacoment-Manadnock Trail, part of the New England Trail a National Scenic Trail. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

*Within 5 years of acquiring land adjacent to or containing a section of the Metacomet-Monadnock (New England) Trail:*

- Work with the State of Connecticut, the East Granby Land Trust, adjacent landowners, and other local interests to explore partnership opportunities related to the trail and the surrounding network of conserved lands in the CPA.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Salmon Brook Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that the use is both appropriate and compatible.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge properties.

# Overview
# Salmon River Conservation Focus Area (Existing Refuge Division)

## East Hampton, Haddam and East Haddam, Connecticut

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 3.699 | 85.6 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *425* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *3,274* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 624 | 14.4 % |
| Total Acres in CFA[2, 4] | 4,323 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

Salmon River was a SFA in the 1995 Conte FEIS and the refuge's Salmon River Division was established in 2009. The area is considered a priority by The Nature Conservancy, the State of Connecticut, and local constitutes because of its tidal freshwater wetlands and location along the mainstem of the Connecticut River. The area is relatively intact and expected to be relatively resilient to climate change. Habitat conservation in this CFA will help allow for the landward migration of the coastal wetland complex (salt-, brackish-, and freshwater tidally influenced wetlands) due to climate change. The Salmon River CFA is also directly across the river from the proposed Maromas CFA. Conserving these two divisions will help provide connectivity on both sides of the Connecticut River. Other existing conserved lands near the Salmon River CFA include the George Dudley Seymour, Haddom Meadows, Haddom Island, and Machimoodus State Parks.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 80.8%
- Freshwater Marsh – 1.3%
- Shrub Swamp and Floodplain Forest – 1.2%

For more information on the habitats in the CFA, see map A.12 and table A.10.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.11 below, there are twelve priority refuge resources of concern (PRRC); terrestrial and aquatic species that may rely upon the diverse habitats in this CFA, three of which are Federal candidate species and one which is listed under the Endangered Species Act. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. This includes extensive tidal wetlands which are part of the Connecticut River estuary system. These wetlands provide habitat for a diversity of species including shorebirds, waterbirds, and waterfowl. The refuge will seek to protect and restore (if necessary) these wetlands and other habitat types. Additionally, we recognize the value of this area to migratory species, forest

interior nesting species, and State Species of Greatest Conservation Need (SGCN). These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   The Salmon River CFA is one of 49 New England cottontail Focus Areas (NECFA) in six states. These focus areas are locations to manage and restore habitat for the New England cottontail. New England cottontail is a candidate species for listing under the Endangered Species Act, and is a species of greatest conservation need in Connecticut. "A Conservation Strategy for the New England cottontail" was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller and Tur 2012). We plan to work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. We will manage approximately, 25 acres of forest in early successional habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a habitat management plan is completed.

   The aquatic habitats in the CFA support two species petitioned for Federal listing, including American eel and brook floater. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, streams, lakes, and ponds of the Salmon River CFA. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000). Brook floater require rivers and streams with high water quality, and are one among many species of freshwater mussels in the CFA.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Salmon River CFA is situated on the Connecticut River, and the forested habitat and tidal wetlands provide very important stopover and breeding habitat for landbirds and shorebirds.

   The PRRC species for the Salmon River CFA include wood thrush and Louisiana waterthrush. This CFA is located within their core breeding range, and the contiguous forests provide breeding habitat for these and other priority conservation concern species. Blue-winged warbler is also a PRRC species, which relies on early successional forests and shrublands in the CFA, habitats in decline throughout the southern portion of the Connecticut River watershed. Bald eagles are also a PRRC species for this CFA. Habitats support nesting, migrating, and wintering bald eagle populations. In addition, the mudflats of the river, creeks and coves, provide foraging habitat for a small number of shorebirds and waders.

3. **Waterfowl**
   The wetland complexes in the Salmon River CFA, consist of shrub swamp and freshwater marsh communities. This habitat is located near the mouth of the Moodus and Salmon Rivers. These areas are flooded during high water events, providing a diversity of plant communities, and habitats for a variety of wildlife species. Large concentrations of American black ducks (a PRRC species), green-winged teal, mallard, Canada geese, and bufflehead utilize these wetlands.

4. **Diadromous fish and other aquatic species**
   The Salmon River serves as the State's reference stream for water quality in the Connecticut River basin and features one of the most diverse and healthy bottom-dwelling invertebrate populations in State. Most of the Salmon River watershed (including upstream of the proposed CFA) is open to migratory aquatic species passage due to the Leesville Dam Fish-way, and other fish-way and dam removal projects. These aquatic habitats support PRRC species such as blueback herring, alewife, brook floater, American eel, and Atlantic salmon.

   The Salmon River is still stocked with juvenile Atlantic salmon as part of the CT DEEP's Atlantic Salmon Legacy Program. Along with the Farmington River, it is the only place in the US where wild Atlantic salmon are present outside of Maine. The Salmon River is important migratory habitat for Atlantic salmon, American shad, and shortnose sturgeon (a federally listed species), and spawning habitat for river herring. This area of the Salmon River is also important as overwintering habitat for shortnose sturgeon. American eel, a species petitioned for Federal listing, spends the majority of their young life in

the freshwater systems of this CFA. The Salmon River CFA also provides important aquatic habitat for freshwater mussels, including brook floater, another species petitioned for Federal listing. Sea lamprey, another species of conservation concern, also occurs in this CFA providing important ecological benefits to aquatic systems.

5. **Wetlands**
From a regional standpoint, there are no areas in the Northeast that support such extensive or high quality fresh and brackish tidal wetland systems as those in the Connecticut River estuary. The lower Connecticut River wetlands and river area consist of over 20 individual tidal wetland units and river islands of various sizes occurring along a 40-mile stretch of the lower Connecticut River from Old Saybrook to Cromwell. Taken as a whole, this area represents a gradation of tidal wetlands from a very narrow zone of relatively high salinity marshes at the mouth of the Connecticut River where it enters Long Island Sound, through an intermediate zone of brackish, lower salinity wetlands, to extensive freshwater tidal marshes and floodplain forests beginning at Deep River and extending upriver to Cromwell (Comins personal communication 2013).

Fifty-five acres of freshwater tidal emergent wetlands and 54 acres of shrub-swamp and floodplain forest occur at the mouth the Salmon River. These tidal wetlands are part of the Connecticut River estuary, and provide habitat for a diversity of species. The Nature Conservancy considers Salmon Cove part of one of the highest quality tidal marsh systems in the Northeast and one of the best tributary systems in the lower reach of the Connecticut River.

One hundred and eighty-seven acres of hardwood swamps are scattered and mostly occur further inland, with the exception of an approximately 57 acre hardwood swamp that occurs on a spit of land at the mouth of the Salmon River.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested and open water habitats) will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, management will focus on maintaining the following conditions:

- Forest management activities will provide a diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and appropriate for site conditions and location. Management of invasive species that weaken or kill native trees (such as Oriental bittersweet) or prevent their regeneration (such as garlic mustard and Japanese stiltgrass) will be a priority. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (streams and rivers) habitats, we will focus on maintaining instream connectivity and outstanding water quality and maintaining cold temperatures for the cold water fisheries. An invasive plant management priority will be to manage species that kill or prevent the regeneration of riparian trees that shade the water. Water chestnut, an invasive aquatic species that can cover and degrade shallow waterbodies has been found in the vicinity and would be a priority for control if found.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, interpretation, and environmental education.

## Were there other special considerations in delineating the CFA boundary?

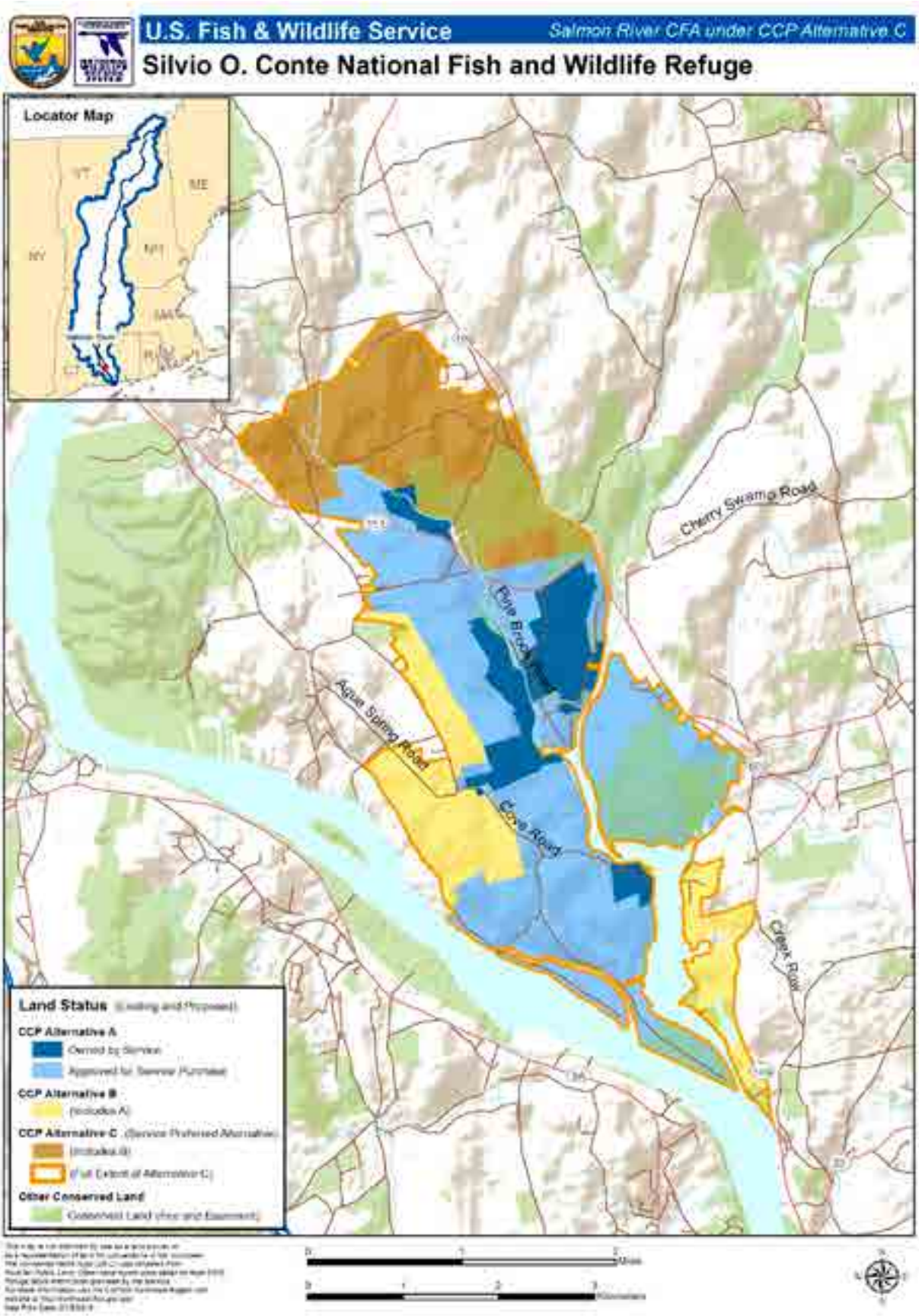
The Venture Smith Site occurs on the existing refuge division. It is an 18th century homestead of African-American archaeological significance and has been identified as potentially eligible for listing on the National Register of Historic Places. Venture Smith (Broteer Furro) was born around 1729 in West Africa, likely in current-day western Mali. At the age of six, he was kidnapped by an enemy tribe and sold to the steward of a Rhode Island slave ship. After a stop in Barbados, Smith was taken to Newport, Rhode Island, and then to Fisher's Island, where he was enslaved for about 13 years.

In 1765, Venture Smith purchased his freedom, and moved to Long Island, where he supported himself by farming, fishing, harvesting wood, river trafficking, and other activities. By 1775, Venture had purchased the freedom of his wife and children. Two years later, he sold his property on Long Island and purchased 10 acres on Haddam Neck in Connecticut, adding 70 acres abutting the Salmon River Cove where he built his dwelling house. He continued to prosper in farming, fishing, lumbering, and river commerce, adding a wharf, small warehouses, blacksmith shop, and other dwellings near his home. In 1798, Venture narrated his life story to Elisha Niles, a Yale graduate and Revolutionary War veteran of anti-slavery background. The published narrative provided an extraordinary account of the American experience of an enslaved African.

Prior to Service acquisition, extensive archaeological investigations were conducted at the site. Evidence of the various homestead buildings was identified, as well as numerous artifacts associated with the lives of Venture Smith and his family.

In addition to the Venture Smith homestead site, the Salmon River Division contains a variety of other archaeological resources, including pre-Contact Native American sites and evidence of other historical settlements.

*Map A.11. Salmon River CFA – Location.*



*Map A.12. Salmon River CPA/CFA – Habitat Types.*

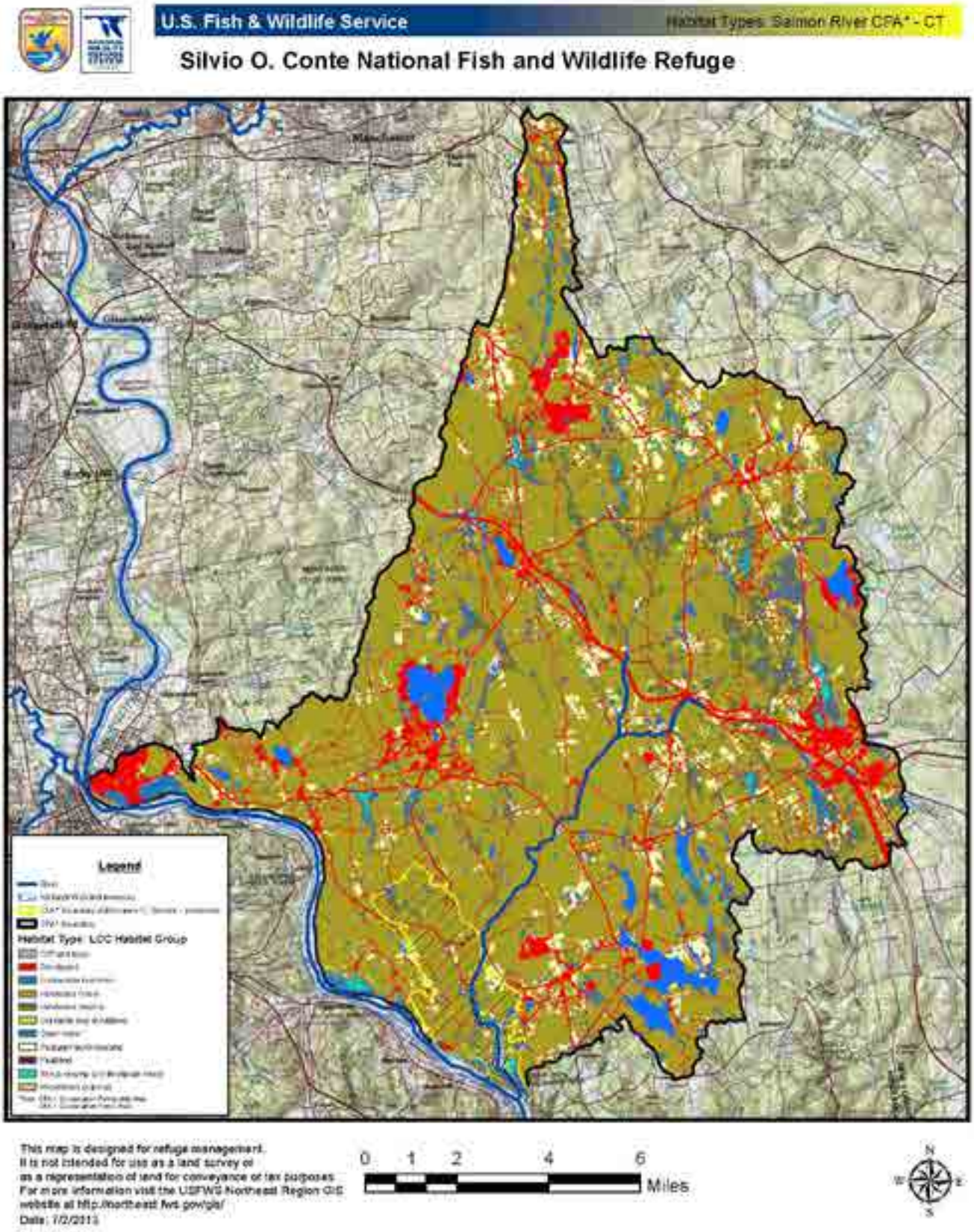


**Table A.10. Salmon River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Hardwood forest | 71,722 | 68.5% | 3,515 | 620 | 264 | 80.8% | 4.9% |
| Hardwood swamp | 9,064 | 8.7% | 187 | 45 | 2 | 4.3% | 2.1% |
| Shrub swamp and floodplain forest | 1,091 | 1.0% | 54 | 22 | 0 | 1.2% | 5.0% |
| Woodlands (natural) | 136 | 0.1% | 23 | 0 | 4 | 0.5% | 17.1% |
| *Forested uplands and wetlands subtotal* | *82,013* | *78.3%* | *3,779* | *687* | *271* | *86.9%* | *4.6%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 26 | 0.0% | 1 | 0 | 0 | 0.0% | 4.2% |
| Freshwater marshes | 581 | 0.6% | 55 | 18 | 0 | 1.3% | 9.4% |
| Old fields and shrubland | 7 | 0.0% | 7 | 6 | 0 | 0.2% | 100.0% |
| Pasture/hay/grassland | 7,378 | 7.0% | 199 | 61 | 0 | 4.6% | 2.7% |
| Peatland | 1 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *7,993* | *7.6%* | *261* | *85* | *0* | *6.0%* | *3.3%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 2,606 | 2.5% | 46 | 9 | 1 | 1.1% | 1.8% |
| *Inland aquatic habitats subtotal* | *2,606* | *2.5%* | *46* | *9* | *1* | *1.1%* | *1.8%* |
| **Other** | | | | | | | |
| Developed | 12,070 | 11.5% | 263 | 32 | 13 | 6.0% | 2.2% |
| *Other subtotal* | *12,070* | *11.5%* | *263* | *32* | *13* | *6.0%* | *2.2%* |
| **TOTAL** | **104,681** | **100.0%** | **4,349** | **813** | **284** | **100.0%** | **4.2%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.11. Salmon River CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 3,515 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Eastern Towhee[A,I]<br>Black-billed Cuckoo[I,J]<br>Broad-winged hawk[A,I,J]<br>Blue-winged Warbler[A,I]<br>Great-crested Flycatcher[A,I]<br>Hooded Warbler[I,J]<br>Sharp-shinned Hawk[I,J]<br>Yellow-throated Vireo[A,I,J]<br>**Eastern Red Bat[I]**<br>**Ovenbird[J]**<br>American Woodcock[A,I]<br>Gray Catbird[A,I,J]<br>Eastern Box Turtle[I]<br>Acadian Flycatcher[I,J]<br>Scarlet Tanager[A,I,J]<br>Black-and-white Warbler[A,I,J]<br>Baltimore Oriole[A,I,J]<br>Prairie Warbler[A,I]<br>Worm-eating Warbler[I,J]<br>Northern Flicker[A,I,J]<br>Cerulean Warbler[A,I,J]<br>Ruffed Grouse[I]<br>Whip-poor-will[A,I]<br>**Chestnut-sided Warbler[I]**<br>Migratory Species |
| **Louisiana Waterthrush**[A] | Breeding habitat includes contiguous (250+ acres) mature deciduous or mixedwood forests along medium to high-gradient, first to third-order, perennial streams (Mattsson et al. 2009, Degraaf et al., 2001). | |
| New England Cottontail[B, D] | Year round habitat includes dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | |
| Blue-winged Warbler[A,B,I] | Breeding habitat includes fields scattered with shrubs and small trees, or young deciduous and mixed forests 1-20 years old (DeGraaf et al. 2001, Gill et al. 2001) | |
| Bald Eagle[C, G] | Breeding, migrating and wintering habitat includes large bodies of open water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf et al. 2001). | |
| **Hardwood Swamp[5] - 187 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-Central Interior and Appalachian rich swamp[H] | Eastern hemlock is usually present and may be dominant in the *North-Central Appalachian acidic swamp system*. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-Central Interior and Appalachian rich swamps* are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include red maple, black ash (*Fraxinus nigra*), as well as calcium loving (calciphilic) herbs. Conifers include American larch, but typically not Northern white cedar, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 54 acres** | | |
| American Black Duck[A, B, C, G] | Migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | American Redstart[I,J]<br>Gray Catbird[A,I,J]<br>Chestnut-sided Warbler[I]<br>Migratory Species<br>**Willow Flycatcher[A, I]**<br>American Woodcock[A,I]<br>Rusty Blackbird[A]<br>**Warbling Vireo[I]**<br>**Spotted Turtle[I]**<br>Eastern Kingbird[A,I,J] |
| New England Cottontail[B, D] | Year round habitat includes shrub swamps of at least 25 acres that are within 1 km of other shrub swamps, and early successional forest patches (Arbuthnot 2008, DeGraaf et al. 2001). | |
| **Woodlands (natural)[5] - 23 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 55 acres** | | |
| **American Black Duck[A, B, C, G]** | Migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Northern Harrier[I,J]<br>Wood Duck[A,I,J]<br>Green-winged Teal[A,I ,J]<br>Snowy Egret[A,I,J]<br>Great Blue Heron[I]<br>Short-billed Dowitcher[A]<br>Bufflehead[A]<br>Canada Goose, NAP[A,J]<br>Canada Goose, AP[A,J]<br>**Virginia Rail[I]**<br>**Marsh Wren[A,I]**<br>Mallard[A,I,J]<br>Lesser Yellowlegs[A,J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Old Fields and Shrublands[5] - 7 acres** | | |
| New England Cottontail[B, D] | Year round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | American Woodcock[A,I,J]<br>Hognosed Snake[I]<br>Eastern Towhee[A,I]<br>Gray Catbird[A,I]<br>Prairie Warbler[A,I]<br>**Brown Thrasher[A,I]**<br>**Field Sparrow[A,I]**<br>Chimney Swift[A,I]<br>Northern Harrier[I,J]<br>Indigo Bunting[I,J]<br>Migratory Species |
| **Blue-winged Warbler[A,B,I]** | Breeding habitat includes fields scattered with shrubs and small trees, or young deciduous and mixed forests 1-20 years old (DeGraaf et al. 2001, Gill et al. 2001) | |
| **Pasture/Hay/Grassland[5] – 199 acres** | | |
| New England Cottontail[B, D] | Year-round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | **Bobolink[I]**<br>**Eastern Meadowlark[I]**<br>Eastern Kingbird[A,I]<br>Chimney Swift[A,I]<br>Northern Harrier[I,J]<br>Migratory Species |
| **Cliff and Talus[5] – 1 acre** | | |
| North-central Appalachian circumneutral cliff and talus[H] | This cliff system occurs at low to mid elevations and consists of vertical or near-vertical cliffs and steep rocky slopes. Substrates include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 46 acres** | | |
| **Alewife[B, F, G]** | Spawn in ponds and slow-moving streams (USFWS 1996). | Smallmouth Bass[I]<br>Tidewater Mucket[I]<br>Golden Club[I]<br>Striped Bass[I]<br>Longnose Dace[I]<br>Yellow Perch[I] |
| Blueback Herring[F, G] | Spawn in fast moving, shallow water when the river temperature is about 58 F (USFWS 1996). | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | |
| **Atlantic Salmon[B, F, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |
| Brook Floater[E] | Inhabits creeks and small rivers, prefers the stable bank conditions afforded by gravel or sandy substrates, and good water quality (Nedeau et al. 2000). | |
| American Black Duck[A, B, C, G] | Migrating and wintering habitat includes open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging (DeGraaf et al. 2001). | Canada Goose, Atlantic[A]<br>Canada Goose, North Atlantic[A]<br>**Bufflehead[A]**<br>Mallard[A]<br>Snowy Egret[A,I,J]<br>Bald Eagle[A,I]<br>Wood Duck[A]<br>Green-winged Teal[A] |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.
BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Salmon River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, Louisiana waterthrush, New England cottontail, blue-winged warbler and bald eagle.

***Rationale:***
We envision healthy forests within the Salmon River CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Connecticut wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Salmon River CFA hardwood forests provide a diversity of habitats for wildlife. To date our review of the Salmon River CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Salmon River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, 2002, Bellemare et al. 2002). Our sub-objective assumes the forests of the Salmon River are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For many species, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Salmon River will contain a variety of patches in different age classes and developmental stages; it will not be uniform throughout. This diversity of age classes provides a variety of species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. The Service's New England cottontail initiative has identified focus areas, including the Salmon River CFA, where the decline in early successional habitats is a particular problem for the New England cottontail. New England cottontail is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of fifteen or more habitat patches, several of which are 25 acres or more. Each habitat patch should be one mile or less from each other to aid in New England cottontail movement between patches (Fuller and Tur 2012). Approximately 25 acres of forest will be managed in early successional habitat in support of New England cottontail in the CFA. Another species of conservation concern that will use these habitat patches is American woodcock. High quality woodcock habitat includes young forest patches within a mile of feeding areas. New England cotton tail habitat patches will be placed in the vicinity of shrub wetlands, where feasible, to benefit this species. If early successional habitat is lacking within the landscape, we will provide other strategically located patches with these conditions to support other species of conservation concern such as chestnut-sided warbler, gray catbird, eastern towhee, black and white warbler, blue-winged warbler, eastern red bat, and ruffed grouse (DeGraaf et al. 2006).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Hardwood forests within the Salmon River CFA should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and Louisiana waterthrush. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). Additionally, wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Louisiana waterthrush prefer a dense, multilayer forest canopy—particularly along high-gradient streams—for protection from nest predation.

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (>75-80% closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, see also Rawinski 2008). The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, Acadian flycatcher, and—when along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the Sharp-shinned hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near open bodies of water, are utilized by bald eagles. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, barred owls, and woodpeckers, like the northern flicker.

In 2011, an extensive inventory of invasive plants revealed populations of several species that could degrade habitats. The most abundant species are Japanese stiltgrass (mostly along Pine Brook riparian areas and other wetland types), Oriental bittersweet (mostly along the Salmon River riparian areas), and Japanese barberry and multiflora rose (mostly within forest interior). Garlic mustard is newer to the division, but has the potential to spread quickly. Local volunteers have been removing garlic mustard and Japanese stiltgrass to prevent their spread within the more pristine interior. Kudzu, one of the most prevalent invasive plants in the southeastern United States was found near the Salmon River Division; this is a very uncommon sighting in central Connecticut, and is of concern to state authorities.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand

types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Develop an Integrated Pest Management Plan.

- Work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. Plan to manage approximately, 25 acres of forest in early successional habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a habitat management plan is completed.

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complements adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible. In particular, manage oriental bittersweet in riparian areas to protect the health of canopy trees that provide migratory bird habitat. Also, control kudzu if detected.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

**Sub-objective 1.1b. (Shrub Swamps and Floodplain Forests)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide habitat for priority refuge resources of concern including American black duck and New England cottontail.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). Our coarse-scale habitat analysis of this CFA identifies a wetland complex, consisting of shrub swamp and freshwater marsh communities, in the southeast portion of the CFA at the mouth of the Salmon River. This area is flooded during high water events, providing a diversity of plant communities, and habitats for a variety of wildlife species, including American black duck and, potentially, New England cottontail.

New England cottontail is a candidate species for listing under the Endangered Species Act, and is a species of greatest conservation need in Connecticut. The historic range of this species likely included southeastern New York, north through the Champlain Valley and into southern Vermont, New Hampshire and Maine, and statewide in Massachusetts, Connecticut, and Rhode Island. Due to loss of early successional habitat to development and forest maturation, this species occupies less than a fifth of its historical range (Fuller and Tur 2012). New England cottontail no longer exists at a sustainable population, and given this conservation urgency, a range-wide New England cottontail Initiative was established. This initiative involves collaboration from multiple agencies, including the USFWS, state wildlife agencies, Universities, Natural Resources Conservation Service, The Nature Conservancy, and Wildlife Management Institute, to address cottontail conservation on a landscape scale.

Focus areas were identified as locations to manage and restore habitat for New England cottontail. The Salmon River CFA was one of 49 focus areas in six states. Early successional management and protection of adjacent natural shrubland habitat, such as shrub swamps, will meet the conservation goals set for the New England cottontail. "A Conservation Strategy for the New England cottontail" was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller and Tur 2012).

American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 30. Black ducks use wetlands, including shrub swamp communities, as stopover habitat during migration, and as breeding and wintering habitat. Well-concealed nests are placed on the ground in nearby uplands or hummocks in wetlands, and adults and their broods forage on seeds, aquatic vegetation, and invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). Open water habitat and the adjacent wetland complex provide excellent wintering and migrating habitat for American black ducks. Given their location on the Connecticut River, an important migration corridor, these wetland communities are used by other waterfowl species during migration including green-winged teal, common merganser, mallards, bufflehead, and wood ducks.

Due to our lack of knowledge of the habitat conditions in the CFA, a comprehensive, multi-scale wildlife habitat inventory will be necessary. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale (shrub swamps), but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- If appropriate, incorporate shrub swamps into the network of habitat patches required for New England cottontail.
- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife utilization of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with

a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Salmon River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide breeding and foraging habitat for priority refuge resources of concern such as American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrsh, jewelweed, marsh fern, water lily and narrow-leaved cattail (Gawler 2008). Our coarse-scale habitat analysis of this CFA identifies freshwater marsh habitat at the mouth of the Salmon and Moodus Rivers.

The wetland complex located at the mouth of the Salmon River is discussed above as it consists of shrub swamp communities, as well as freshwater marsh communities. The wetland at the mouth of Moodus River is a large freshwater marsh that is adjacent to tidal flats in the Salmon River. The marsh vegetation in this wetland complex includes wild rice, a nutritious food source for waterfowl. Both locations provide excellent stopover habitat during migration, and breeding and wintering habitat for American black duck, and other waterfowl species. Please see sub-objective 1.1b for species specific details.

Due to our lack of knowledge of the habitat conditions in the CFA, a comprehensive, multi-scale wildlife habitat inventory will be necessary. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale (freshwater marsh), but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA. Baseline information on the condition of freshwater marsh habitat at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate wetland hydrology for impacts to natural flow regimes.
- Continue to control invasive water chestnut in marshes.
- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Inventory wetland plant communities.
- Maintain current and increase native wild rice population.
- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland and Old Fields and Shrublands)**
Provide appropriate conditions within current pasture, hay, and grassland acreage, and old field and shrubland habitat that will support New England cottontail (where appropriate), and other shrub-dependent conservation concern species such as blue-winged warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Over four percent of the Salmon River CFA is typed as pasture, hay, grassland, old fields and shrublands. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses, while shrubs dominate shrublands, and a mixture of shrubs and grasses tend to occur in old fields.

Many bird species of conservation concern rely on these habitats, including grassland dependent species such as bobolink and grasshopper sparrow, and shrub dependent species such as blue-winged warbler, prairie warbler, field sparrow, American woodcock, and chestnut-sided warbler. Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occur in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Another species of conservation concern that uses shrubland dominated habitat is New England cottontail. This species is New England cottontail is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut. The Salmon River CFA is a New England cottontail Focus Area, which are areas identified as locations to manage and restore habitat for New England cottontail. New England cottontail require early successional habitat (dense shrubs and tree saplings), and the pastures, hay fields, grasslands, shrublands and old fields in the CFA will provide this habitat with very little initial manipulation.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of fifteen or more habitat patches, several of which are 25 acres or more. Each habitat patch should be one mile or less from each other to aid in New England cottontail movement between patches (Fuller and Tur 2012). Where appropriate and suitable, pastures, hay fields, grasslands, shrublands, and old fields will be incorporated into the network of patches managed for New England cottontail by allowing woody stem colonization.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, grassland, old fields and shrubland acres can provide quality habitat if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
See rationale for sub-objective 1.1c.

Habitats that occur within the Salmon River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated

occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Salmon River CFA to benefit priority refuge resources of concern including American eel, alewife, blueback herring, Atlantic salmon, and brook floater, as well as other species of conservation concern such as sea lamprey. Also provide undisturbed wintering and stopover habitat for American black duck, and other waterfowl.

***Rationale:***
The Salmon River and two of its tributaries, Pine Brook, and Moodus River are important aquatic ecosystems in the CFA. The Salmon River is still stocked with juvenile Atlantic salmon as part of the CT DEEP's Atlantic Salmon Legacy Program. Along with the Farmington River, it is the only place in the US where wild Atlantic salmon are present outside of Maine. Most of the Salmon River watershed (including upstream of the proposed CFA) is open to migratory aquatic species passage due to the Leesville Dam Fish-way, and other fish-way and dam removal projects. Pine Brook is also remarkable fish habitat; this brook's former dams have washed out and migratory fish have access to their full historic habitat up to a natural falls about two miles upstream of the mouth. Pine Brook also provides spawning habitat for Adult Atlantic salmon. Furthermore, it is one of very few places in Connecticut where the head of tide is located in an undeveloped area and not subjected to intense sport and commercial fisheries.

The Salmon River is important migratory habitat for Atlantic salmon, American shad, and spawning habitat for river herring. American eel, a species petitioned for federal listing, spend the majority of their young life in the freshwater systems of this CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000). The Salmon River CFA also provides important aquatic habitat for freshwater mussels, including brook floater, a species petitioned for Federal listing.

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems,

their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

The open water habitat within the Salmon River, Connecticut River mainstem and wetlands provide excellent wintering and stopover habitat for American black duck. Other migratory waterfowl also take advantage of these secluded areas including green-winged teal, common merganser, mallards, bufflehead and wood ducks.

The aquatic habitats in the Salmon River CFA are diverse, and provide habitat for a variety of wildlife species. Development and human activities have impacted water quality and infringed on aquatic species movements and life cycles. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Work with partners to protect and increase "hard bottom" (e.g., gravel, cobble, or bedrock) for spawning aquatic species.
- Work with partners to reduce combined sewer overflow.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate stream and fish community health.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Salmon River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes

is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Salmon River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Salmon River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Salmon River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Salmon River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Salmon River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Salmon River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements about natural and cultural resources to be used in the delivery of programming at the Salmon River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.
- Work with regional cultural resources staff to develop interpretive messages about the historical importance of Venture Smith and his property.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members and the general public, with priority given to refuge affiliates.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See the rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Salmon River Division. Interpretive programs would cover both natural and cultural resource themes, including the importance of Venture Smith and his property.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media e.g. pamphlets, signs, etc.

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Salmon River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Salmon River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. Under Service ownership, the division south of State Highway 151 has been open to hunting, excluding safety zones around buildings, under a pre-acquisition compatibility determination. In partnership with the Connecticut Department of Energy and Environmental Protection, hunting regulations follow that of nearby state-owned lands. Prior to Service acquisition, hunting was allowed through a lottery system administered by The Nature Conservancy. Retaining hunting opportunities at this division conforms to historic use on this property and much of the surrounding land in the area. Principal game species include white-tailed deer, Eastern wild turkey, and cottontail rabbits.

**Management Strategies:**
*Continue to:*

- Allow hunter access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are discernable.
- Open newly acquired lands to hunting, if found to be compatible.
- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions to support a safe, manageable hunt program.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Salmon River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide the opportunity for a quality fishing experience based on Connecticut Department of Energy and Environmental Protection regulations, and division-specific conditions, if necessary.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The division has been open to fishing, following acquisitions, through pre-acquisition compatibility determinations, but no formal opening package or fishing plan has been completed. Fishing opportunities on the division are currently limited to sections of the Salmon River and Pine Brook. Both support game fish populations.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are discernable.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Salmon River Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of CCP approval:*

- Work with the Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Although most dedicated anglers will be drawn to the nearby Connecticut River, the reaches of Salmon River and Pine Brook on the division do offers fishing opportunities. Visitors unaware of this available resource may choose to participate while on the division.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity. Opening acquired land in this new division to wildlife observation and photography will provide visitors a chance to see and photography a variety of wildlife species in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
*Continue to:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.
- Allow wildlife observation and photography at the Salmon River Division.

*Within 1 year of CCP approval:*

- Install an informational kiosk to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 10 years of CCP approval:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the division.

***Rationale:***
The open portions of the division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Salmon River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include a Connecticut River waterway trail. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

*Within 5 years of acquiring land with Connecticut River frontage:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Salmon River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Salmon River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Allow bicycles on the Salmon River Road.
- Allow canoeing and kayaking in acquired coves and waterways.

*Within 5 years of CCP approval:*

- Work with friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Scantic Conservation Focus Area (Proposed)

## Windsor, East Windsor, South Windsor, Hartford, and East Hartford, Connecticut

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 4,128 | 89.5 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *4,128* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 484 | 10.5 % |
| Total Acres in CFA[2, 4] | 4,612 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

Scantic was a SFA in the 1995 Conte FEIS. The Scantic CFA area is considered important floodplain forest by The Nature Conservancy and the proposed CFA would allow for the restoration and conservation of the floodplain forest and associated wetland complex. Habitat conservation in this CFA will help allow for the landward migration of the coastal wetland complex (salt-, brackish-, and freshwater tidally influenced wetlands) due to climate change.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Pasture/Hay/Grassland – 30.3%
- Hardwood Swamp – 22.8%
- Freshwater Marsh – 6.1%

For more information on the habitats in the unit, see map A.14 and table A.12.

**What are the resources of conservation concern for the proposed CFA?**

As noted in table A.13 below, there are seven priority refuge resources of concern (PRRC) aquatic and terrestrial species that rely upon the open water and wetland habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. This includes floodplain habitats which have undergone significant alteration within the Connecticut River watershed. The refuge will seek to protect and restore (if necessary) these, and other PRRC habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and migratory birds. These species and habitats are discussed further below.

1. **Federal Threatened and Endangered Species**
   This section of the Connecticut River provides crucial spawning habitat for the federally listed shortnose sturgeon. This species is not known to spawn in any other sections or tributaries of the river in Connecticut. American eel, a species petitioned for listing, also occupy the main stem and tributaries within the Scantic CFA.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Scantic CFA is situated on the Connecticut River, and provides important stopover habitat for landbirds, shorebirds, and waterbirds.

3. **Waterfowl**
   The freshwater marshes, hardwood swamps and open water of the Connecticut River provide important stopover areas for migrating and wintering waterfowl. Large concentrations of American black ducks (a PRRC species), green-wing teal, mallard, and American wigeon use habitats in this CFA. Other species include Canada geese, bufflehead, canvasback, wood duck, northern pintail, gadwall, and mergansers.

4. **Diadromous fish and other aquatic species**
   The Scantic CFA straddles the Connecticut River, and is located at the mouth of the Podunk, Scantic, and Farmington Rivers. Many species of conservation concern use these aquatic habitats including PRRC species like American shad, shortnose sturgeon, American eel, alewife, blueback herring, and Atlantic salmon.

   This section of the Connecticut River, and mentioned tributaries are important spawning habitat for shad, alewife, and blueback herring. The main stem also provides crucial spawning habitat for the federally listed shortnose sturgeon. This species is not known to spawn in any other sections or tributaries of the river in Connecticut. American eel also occupy the main stem and tributaries within the Scantic CFA. Sea lamprey, another species of conservation concern, occurs in this CFA providing important ecological benefits to aquatic systems.

5. **Wetlands**
   The Scantic CFA contains a small portion of ecologically significant floodplain habitat (Marks et al 2011) located along the Connecticut River main stem extending from west side of the river from North Meadows of Hartford to Windsor and on the east side of the river from East Hartford almost to Enfield. The remnant patches of floodplain habitat in the Scantic River CFA are vulnerable to invasive species, especially habitats that flood infrequently. Opportunities may be available for floodplain restoration in areas where these habitats have been altered.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e. forested, non-forested, and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once the inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will focus on restoration of degraded floodplains, including restoring the primary natural disturbance mechanism (seasonal flooding) and species composition and structure to accepted historical conditions. Management of upland forests will also provide structurally diverse habitat dominated by species appropriate to site conditions and location.

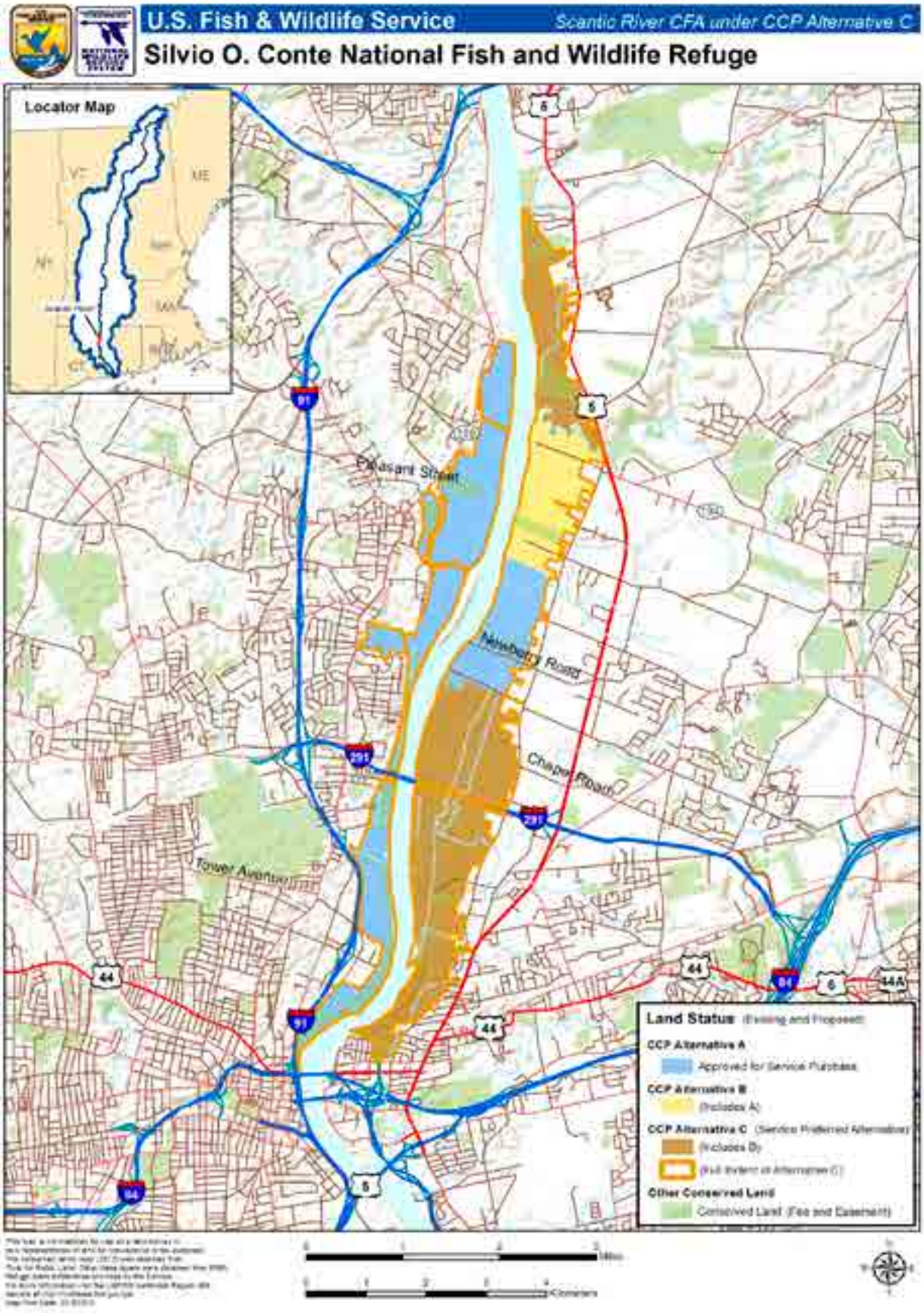
- We will also manage emergent and shrub wetland habitats, and will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (stream, rivers, and coves) habitats, we will focus on maintaining stream connectivity, establishing riparian buffers, and reducing run-off from the surrounding landscape.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

When compatible, we would seek to provide recreational access to the river for priority public uses (hunting, fishing, wildlife observation and photography, interpretation, and environmental education) and for boating.

*Map A.13. Scantic CFA – Location.*



*Map A.14. Scantic CFA – Habitat Types.*

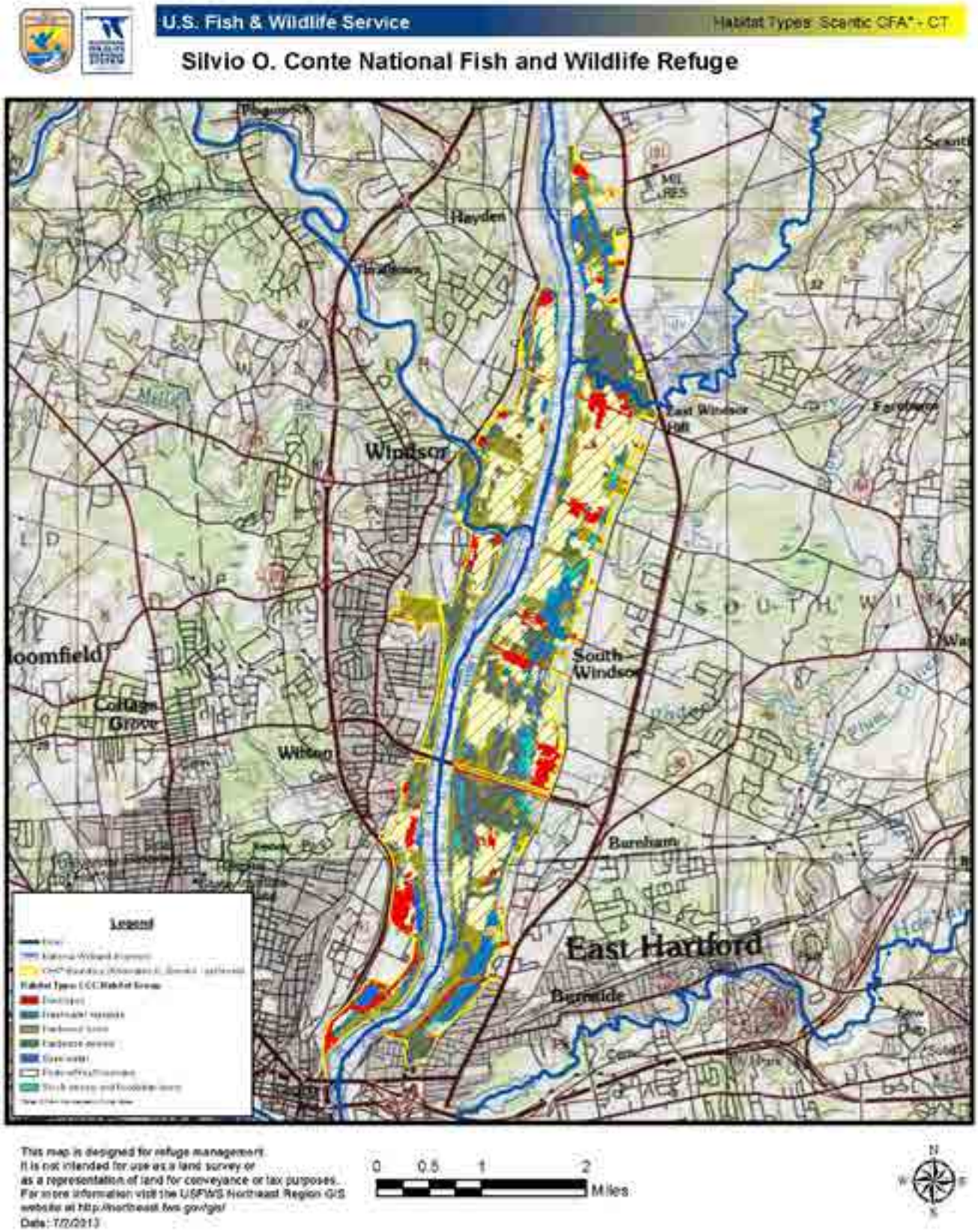


**Table A.12. Scantic CFA – Habitat Types.**

| LCC General Habitat Type[1] | CFA[2] | | | |
|---|---|---|---|---|
| | Total Acres | Conserved by Others[3] | USFWS Owned[4] | Percent CFA[5] |
| **Uplands and Wetlands[6]** | | | | |
| Hardwood forest | 1,074 | 228 | 0 | 23.3% |
| Hardwood swamp | 1,049 | 106 | 0 | 22.8% |
| Shrubland swamp and floodplain forest | 114 | 7 | 0 | 2.5% |
| *Forested uplands and wetlands subtotal* | *2,238* | *341* | *0* | *48.6%* |
| **Non-forested Uplands and Wetlands[6]** | | | | |
| Freshwater marshes | 280 | 36 | 0 | 6.1% |
| Pasture/hay/grassland | 1,393 | 38 | 0 | 30.3% |
| *Non-forested uplands and wetlands subtotal* | *1,672* | *74* | *0* | *36.3%* |
| **Inland aquatic habitats[6]** | | | | |
| Open Water | 210 | 24 | 0 | 4.6% |
| *Inland aquatic habitats subtotal* | *210* | *24* | *0* | *4.6%* |
| **Other** | | | | |
| Developed | 483 | 45 | 0 | 10.5% |
| *Other subtotal* | *483* | *45* | *0* | *10.5%* |
| **TOTAL** | **4,602** | **484** | **0** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Focus Area; representing Service - preferred Alternative C

3- Acres in the CFA currently conserved by others (TNC 2012)

4 - Acres in the CFA currently owned by the USFWS

5 - Percentage of the CFA represented by the habitat type

6 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternativeve

**Table A.13. Scantic CFA – Preliminary Priority Refuge Resources of Concern**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 1,074 acres** | | |
| Appalachian (hemlock)-northern hardwood forest[H]<br><br>Northeastern interior dry-mesic oak forest[H] | Northern hardwoods such as sugar maple, yellow birch, and American beech are characteristic of the *Appalachian (hemlock)-northern hardwood forest,* either forming a deciduous canopy or mixed with eastern hemlock (or in some cases white pine ). Other common and sometimes dominant trees include Oak spp. (most commonly red oak, tulip poplar, black cherry, and black birch. *Northeastern interior dry-mesic oak forests* are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. Soils are acidic and relatively infertile but not strongly drought prone. Oak species characteristic of dry-mesic conditions (e.g., red oak, white oak, black oak, and scarlet oak and hickory are dominant in mature stands. Chestnut oak may be present but is generally less important than the other oak species. American chestnut was a prominent tree before chestnut blight eradicated it as a canopy constituent. Red maple, black birch, and yellow birch may be common associates. With a long history of human habitation, many of the forests are early in their development following disturbance, where White pine, Virginia pine, or tulip poplar may be a dominant or codominant presence. On hills and slopes within these forests, pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with red maple, swamp white oak, or black tupelo characteristic (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Swamp[5] - 1,049 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-central interior wet flatwoods[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. The acidic substrate is mineral soil, often with a component of organic muck (organic matter 20 to 65 percent); if peat (greater than 65 percent organic material) is present, it usually forms an organic top soil horizon over mineral soil rather than a true peat substrate. Eastern hemlock 1s usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-central interior wet flatwoods* usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, akeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. Pin oak typically dominates and is often associated with swamp white oak and Red maple. American sweetgum and black tupelo are also common associates. Understory herbaceous and shrub species present in examples of this system can vary. Some common species include sedges, cinnamon fern, common buttonbush, alder, and holly (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 114 acres** | | |
| **American Black Duck**[A, B, C, G] | Migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Northern Harrier[I,J]<br>Wood Duck[A,I,J]<br>Green-winged Teal[A,I ,J]<br>Snowy Egret[A,I,J]<br>Rusty Blackbird[A]<br>**American Bittern[A,I]**<br>Common Merganser[I]<br>Bufflehead[A]<br>Canada Goose, NAP[A,J]<br>Canada Goose, AP[A,J]<br>**Virginia Rail[I]**<br>**Marsh Wren[A,I]**<br>Mallard[A,I,J]<br>Davis' Sedge[I]<br>Waputo[I]<br>Gray Catbird[A,I,J]<br>**Willow Flycatcher[A, I]**<br>**Warbling Vireo[I]**<br>**Spotted Turtle[I]**<br>Eastern Kingbird[A,I,J] |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 280 acres** | | |
| **American Black Duck**[A, B, C, G] | Migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Northern Harrier[I,J]<br>Wood Duck[A,I,J]<br>Green-winged Teal[A,I ,J]<br>Snowy Egret[A,I,J]<br>Rusty Blackbird[A]<br>**American Bittern[A,I]**<br>Common Merganser[I]<br>Bufflehead[A]<br>Canada Goose, NAP[A,J]<br>Canada Goose, AP[A,J]<br>**Virginia Rail[I]**<br>**Marsh Wren[A,I]**<br>Mallard[A,I,J]<br>Davis' Sedge[I]<br>Waputo[I]<br>Gray Catbird[A,I,J]<br>**Willow Flycatcher[A, I]**<br>**Warbling Vireo[I]**<br>**Spotted Turtle[I]**<br>Eastern Kingbird[A,I,J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland[5] – 1,393 acres** | | |
| Where appropriate and supported by the local community, restore to floodplain forest | *Laurentian-Acadian floodplain forest* occur along medium to large rivers, and include a matrix of upland and wetland habitats. Floodplain forests, with silver maple are characteristic, as well as herbaceous sloughs and shrub wetlands. Most areas are underwater each spring; micro-topography determines how long the various habitats are inundated. Associated trees include red maple and American hornbeam, the latter frequent but never abundant. On terraces or in more calcium rich areas, sugar maple or red oak may be locally prominent, with yellow birch and ash, black willow is characteristic of the levees adjacent to the channel. Common shrubs include silky dogwood and viburnum. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern-dominated understory in many areas by mid-summer. Non-forested wetlands associated with these systems include shrub-dominated and grass-non-woody vegetation (Gawler 2008). | Migratory Species |
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 210 acres** | | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Smallmouth Bass[I]<br>Burbot[I]<br>Striped Bass[I]<br>Pumpkinseed[I]<br>Longnose Dace[I]<br>Yellow Perch[I] |
| **Shortnose Sturgeon[B, D, F, G]** | Spawn in slow-moving, 48 F water of large rivers, and feed in fresh and brackish water along the river bottom (USFWS 1996). | |
| **Alewife[B, F, G]** | Spawn in ponds and slow-moving streams (USFWS 1996). | |
| **Atlantic Salmon[B, F, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |
| Blueback Herring[F, G] | Spawn in fast moving, shallow water when the river temperature is about 58 F (USFWS 1996). | |
| **American Shad[B, F, G]** | Spawn when the water temperature is above 60° F in shoal area of river and lower reaches of larger tributaries (USFWS 1996). | |
| American Black Duck[A, B, C, G] | Migrating habitat includes open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging (DeGraaf et al. 2001). | Canada Goose, Atlantic[A]<br>Canada Goose, North Atlantic[A]<br>**Bufflehead[A]**<br>Mallard[A]<br>Snowy Egret[A,I,J]<br>Bald Eagle[A,I]<br>Wood Duck[A]<br>Green-winged Teal[A] |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH).

Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Scantic CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
We envision healthy forests within the Scantic CFA where a diverse seral structure provides suitable habitat conditions for a suite of Connecticut wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010).

Scantic CFA hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is certainly available within the CFA. To date our review of the Scantic CFA habitats and wildlife species —and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Scantic comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, 2002, Bellemare et al. 2002). Our sub-objective assumes the forests of the Scantic are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and where appropriate, move succession forward to emulate later seral stage characteristics.

Migrating landbirds are typically unable to deposit sufficient fat stores to fly nonstop between breeding and nonbreeding areas (Blem 1980) and must use stopover habitats for feeding and resting before continuing migration. Studies have shown migrating birds exhibit selective use of some habitats over others (Moore et al. 1990, Petit 2000, Rodewald et al. 2004). In general, taller, more structurally diverse vegetation types within an area appear to support greater numbers of migrating birds than do habitats of lower stature and complexity (Moore et al. 1990, Noss 1991). Clearly, structurally complex habitats will not be suitable for all migratory species, but our conservation goal is to provide those areas used most frequently by migrating birds, suggesting relatively tall, structurally diverse habitats may best serve this purpose. The plasticity in habitat use exhibited by most species during migration (Moore et al. 1990, Petit 2000) suggests that many species are able to effectively use the food resources and cover afforded by structurally complex habitats. While our management goals may create a relatively old forest, hardwood forests within Scantic will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of foraging opportunities. Patches of mature edge-dominated (i.e. forest-agricultural edge and suburban forest of the type within Scantic) and shrub-sapling stage forests were used most frequently by fall stopover migrants in a Pennsylvania study (Rodewald et al. 2004).

In a mature forest, many migrating bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Hardwood forests within Scantic should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of foraging opportunities. Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral shrub-sapling habitat rich in fruits and insects important to migrating birds (Noss 1991, DeGraaf et al. 2006). Efforts to regenerate any portion of forest within the CFA must account for the abundance of invasive understory species and risk of regeneration failure from white-tailed deer overbrowsing (Hochholzer 2010)

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners, including the State of Connecticut, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

**Sub-objective 1.1a. (Hardwood swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
Occurrences of hardwood swamps within the Scantic Conservation Focus Area (CFA) represent a number of natural communities. Historically they have undergone significant alteration, and have great potential for restoration. Acidic hardwood swamps may be found in basins, or on gently sloping seepage lowlands within small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Eastern hemlock is often the dominant overstory species, and the organic substrate supports an important sphagnum (moss) layer.

Hardwood swamp occurrences within Scantic with more alkaline soils are often found along riparian and floodplain areas in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the water table drives complexes of forest upland and wetland species including pin oak, red maple, swamp white oak, sweetgum, and blackgum. The examples identified within the Scantic CFA occur within the floodplain of the Connecticut River.

These two systems do share a common disturbance history; agricultural practices, development pressures, and selective logging have largely removed these habitats from the landscape, or greatly simplified their historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats. Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within the Scantic will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for spring and fall migrant birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites shown to be important during the energy-intensive migration (Petit 2000).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State of Connecticut in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide breeding, foraging and stopover habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Our coarse-scale habitat analysis of this CFA identifies an 8-mile wetland complex in South Windsor on the east side of the Connecticut River. This complex is floodplain habitat consisting of a mosaic of freshwater marsh, shrub swamp, and hardwood swamp. This area is also interspersed with agricultural land, and adjacent to East Hartford. Please see sub-objective 1.2a for a detailed discussion on this wetland complex, freshwater marsh communities, and priority resources of concern.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marsh communities to support natural and rare ecological communities, and provide breeding, wintering and stopover habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily and narrow-leaved cattail (Gawler 2008). The freshwater marsh habitat within the Scantic CFA is part of a larger wetland complex on the east side of the Connecticut River. This complex is floodplain habitat consisting of freshwater marsh, shrub swamp, and hardwood swamp. It is also interspersed with agricultural land and adjacent to East Hartford. This area is under intense development pressure, threatening state listed and refuge priority resources of concern.

This floodplain habitat in the Scantic CFA is a state priority for conservation. It provides habitat for a suite of species of conservation concern. American black duck, a refuge priority resource of concern and NALCC representative species for freshwater marsh, winters in the Scantic CFA. Black ducks forage on aquatic vegetation in wetlands during the winter and on invertebrates and vegetation during migration. The Connecticut River is an important migration corridor, and the Scantic CFA also supports migratory Canada geese, bufflehead,

canvasback, American wigeon, mallard, wood duck, northern pintail, gadwall, and mergansers. The freshwater marshes also support several rails and bitterns during the breeding season and migration.

Threats to this wetland complex are altered hydrology, contamination, and non-native invasive plant species. A multi-scale wildlife habitat inventory will be necessary to determine the condition of all habitats in the CFA. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Encourage local landowners to use Connecticut Best Management Practices within active agricultural fields that are located along the perimeter of marsh habitats.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Map natural communities; protect rare or exemplary examples.
- Survey wildlife use of wetlands.
- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Restore historic composition and structure, and improve the natural hydrology and landscape connectivity to support natural and rare ecological communities. Management will provide stopover habitat for migratory species.

***Rationale:***
Thirty percent of the Scantic CFA is typed as pasture, hay, and grassland habitat. The majority of these habitats is in active agricultural use, and is located in floodplain of the Connecticut River. This large floodplain extends approximately 8 miles along the Connecticut River, and is a natural flood storage area for the surrounding communities.

The topography and natural processes of floodplain systems result in the development of complex upland and wetland vegetation on generally flat topography, and soils deposited by the river. The Scantic CFA has this diversity of habitats in areas not cleared for agricultural use. Hardwood forests and swamps, shrub swamps, and freshwater marsh are part of the floodplain. Silver maple is a characteristic species of a floodplain forest, as well as red maple, ash, red oak, and yellow birch. Common shrubs include black willow, silky dogwood, and viburnums. The herbaceous layer within the forested portions of the floodplain, include spring ephemerals and ferns (Gawler 2008).

Restoration of this floodplain will provide a more contiguous and diverse breeding and migratory habitat for a variety of wildlife species. The Scantic CFA is significant migration habitat as it straddles the Connecticut River, an important migratory corridor. A restored floodplain will also improve its function to retain and slow flood waters, reducing the extent of damage to the surrounding communities, and thereby improving water quality.

However, we also support the protection of high-value, productive agricultural lands identified by local communities and the State. It is not the refuge's intention to target these lands for acquisition. Instead, our priority would be to work with individual landowners, states, and other Federal agencies to protect these lands and ensure they continue to be part of the working landscape. There are many State and Federal programs that protect agricultural lands and help promote farming practices that benefit wildlife and help protect water quality. Through our private lands program, we will help direct landowners who are interested in these programs to the proper state and Federal agencies and programs. In rare cases, we may acquire agricultural lands from willing sellers, when other options to keep the land in agricultural production are not available, of if habitats for Federal trust resources are in jeopardy from development or other land use changes.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners and landowners to promote farming practices that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- As new pasture, hay, and/or grassland habitat is acquired, evaluate its ecological importance to determine if it should be maintained or if it should restored to native forest through tree plantings or natural succession.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Scantic CFA and Connecticut River to benefit priority refuge resources of concern including American shad, shortnose sturgeon, American eel, alewife, blueback herring, and Atlantic salmon, as well as other species of conservation concern such as sea lamprey.

***Rationale:***
The Scantic CFA straddles the Connecticut River, and is located at the mouth of the Podunk, Scantic, and Farmington Rivers. Many species of conservation concern use these aquatic habitats including American shad, shortnose sturgeon, American eel, alewife, blueback herring, Atlantic salmon, and sea lamprey.

This section of the Connecticut River, and mentioned tributaries are important spawning habitat for shad, alewife, and blueback herring. The main stem also provides crucial spawning habitat for the federally listed shortnose sturgeon. This species is not known to spawn in any other sections or tributaries of the river in Connecticut.

American eel also occupy the main stem and tributaries within the Scantic CFA. American eel are long lived, and spend the majority of their young life in these freshwater systems. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems, their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

The aquatic habitats in the Scantic CFA provide habitat for many species of conservation concern, and is especially important for the federally listed shortnose sturgeon. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to maintain open channels from the Connecticut River to open water coves.

- Work with adjacent landowners to eliminate barriers to aquatic species passage.

*Within 10 years of land acquisition and CCP approval:*

- Work with partners to protect and increase “hard bottom” (e.g., gravel, cobble, or bedrock) for spawning aquatic species.

- Work with partners to reduce combined sewer overflow.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Scantic Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Scantic Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Scantic Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Scantic Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Scantic Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale*:**
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Scantic Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Scantic Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Scantic Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Scantic Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.

- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Scantic Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Scantic Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
The Scantic CFA is comprised of floodplain forests and wetlands adjacent to the Connecticut River. Existing public hunting in the area is limited to the Connecticut River proper for waterfowl and Kings Island Coop Wildlife Management Area which offers waterfowl hunting under a state permit. Much of the Scantic CFA is adjacent to municipal Hartford which limits hunting opportunities. We will coordinate with Connecticut Department of Energy and Environmental Protection, Hunting Review Team following acquisition of land where hunting is feasible and has been found to be a compatible use. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contributes to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions to support a safe, manageable hunt program, consistent with the final compatibility determination.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disable hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of a refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Scantic Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*

- Work with Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.
- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Scantic Division after completing all administrative procedures to officially open refuge lands to fishing, based on Connecticut Department of Energy and Environmental Protection regulations and division-specific regulations, if necessary.

***Rationale:***
The principal fishing resources on this CFA are the Connecticut River and the lower reaches of the Scantic and Farmington rivers. The Podunk River, Newberry and Stoughton brooks are also within the CFA. Most people fish the Connecticut River from boats, but allowing bank fishing on a Scantic Division would provide the public with another recreational opportunity. Fishing is a popular activity in this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Scantic River Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land with fishable waters:*

- Work with the Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity. Opening acquired land in this new division to wildlife observation and photography will provide visitors a chance to see and photography a variety of wildlife species in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses.)

*Within 1 year of acquiring land:*
- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*
- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*
- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*
- Implement the visitor use enhancements identified in the public access strategy and the refuge visitor services plan.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Scantic Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route.

**Management Strategies:**
*Within 5 years of acquiring land:*
- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Scantic Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Scantic Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Allow canoeing and kayaking in acquired coves and waterways.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Whalebone Cove Conservation Focus Area (Existing Refuge Division)

## East Haddam and Lyme, Connecticut

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 3,786 | 54.3 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *97* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *3,689* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 3,192 | 45.7 % |
| Total Acres in CFA[2, 4] | 6,978 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

The proposed Whalebone Cove CFA encompasses five SFAs from the 1995 Conte FEIS. It is part of larger area considered a priority for conservation by the State of Connecticut. The proposed CFA is located in an area with an extensive conserved lands network, including Selden Neck State Park, Becket Hill State Park Reserve, Mount Archer, and other privately conserved lands. Additional land protection by the Service in this area will help better connect these conserved lands. Also, this CFA is expected to be fairly resilient to project climate change impacts. Land conservation in the Whalebone Cove CFA and lower portion of the Quonatuck CFA will help facilitate the landward migration of the coastal wetland complex.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 80.5%
- Freshwater Marsh – 6.5%
- Shrub Swamp and Floodplain Forest – 2%

For more information on the habitats in the CFA, see map A.16 and table A.14.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.15 below, there are 13 priority refuge resources of concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA, one of which is a Federal candidate species and another that is listed as Federal endangered. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. This includes extensive tidal wetlands which are part of the Connecticut River estuary system. These wetlands provide habitat for a diversity of species including shorebirds, waterbirds, and waterfowl. The refuge will seek to protect and restore (if necessary) these wetlands and other habitat types. Additionally, we recognize the value of this area to migratory species, forest interior nesting species, and State Species of Greatest Conservation Need (SGCN). These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   The Whalebone Cove CFA is one of 49 New England cottontail Focus Areas (NECFA) in 6 states. These focus areas are locations to manage and restore habitat for New England cottontail. New England cottontail is a candidate species for listing under the Endangered Species Act, and is a species of greatest conservation need in Connecticut. "A Conservation Strategy for the New England cottontail" was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller and Tur 2012). We plan to work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. We will manage approximately, 375 acres of forest in early successional habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a habitat management plan is completed.

   Juvenile Atlantic sturgeon were recently documented in the lower portion of the Connecticut River (S. Gephard, CTDEEP, personal communication 2015). This Federal endangered species and a species of greatest conservation need in Connecticut, were once considered extirpated in the Connecticut River, as reproduction no longer occurred in the main stem (Sprankle personal communication 2014). The documentation of juveniles provides a higher probability and opportunities for recovery of this species in the Connecticut River.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Whalebone Cove CFA is situated on the Connecticut River, and the forested habitat and tidal wetlands provide very important stopover and breeding habitat for landbirds and waterbirds.

   The PRRC species for the Whalebone Cove CFA include wood thrush and Louisiana waterthrush. This CFA is located within their core breeding range, and the contiguous forests provide breeding habitat for these and other forest nesting birds, many of which are priority conservation concern species. In fact, Audubon has included the Eightmile River Watershed (within the CFA) as a focal area for forest conservation efforts due to a high concentration of forest nesting birds (P. Comins, Audubon Connecticut, personal communication 2013). Blue-winged warbler is also a PRRC species, which relies on early successional forests and shrublands in the CFA, habitats in decline throughout the southern portion of the Connecticut River watershed.

   Osprey and bald eagle are also PRRC species for this CFA. The open water habitats within the lower Connecticut River constitute the core of breeding osprey in the State, and supports nesting bald eagles, as well as a significant wintering bald eagle population. The mudflats of the river, creeks and coves, provide foraging habitat for shorebirds and wading birds including willets and lesser and greater yellow-legs. Snowy egrets, a PRRC and state species of concern also use these wetlands as foraging areas. In addition, the freshwater tidal wetlands in the lower Connecticut River, and CFA, also provide significant stopover habitat, and potentially breeding habitat, for rails including Virginia, sora, and king rails.

3. **Waterfowl**
   The large tidal wetland complexes in the Whalebone Cove CFA provide excellent food sources for a diversity of waterfowl (TNC 2013). Large concentrations of American black ducks (a PRRC species) occupy habitats during migration and the winter. And located on the Connecticut River, an important migration corridor, these habitats are used by other waterfowl species during migration including green-winged teal, common merganser, mallards, bufflehead, and wood ducks.

4. **Diadromous fish and other aquatic species**
   Whalebone Cove CFA aquatic habitats are among the highest in quality of the shallow fresh water bays, coves, tidal creeks, and tributaries which typify the Lower Connecticut River and the significant overwintering, spawning and feeding habitat they provide for a large number of fish species. Many species of conservation concern use these aquatic habitats including PRRC species like American eel, alewife, the Federal listed Atlantic sturgeon, blueback herring, and brook trout.

Many of the tidally influenced coves and creeks provide important spawning habitat for alewife and blueback herring. These creeks also provide excellent nursery habitat for these species. American eel also occupy tidally influenced aquatic systems, as well as the non-tidal rivers. Brook trout occur in the upland portions of the CFA, where free-flowing cold water habitat is present, and a requirement for this species life cycle. Juvenile Atlantic sturgeon were documented recently in the lower portion of the CT River. Sea lamprey, another species of conservation concern, occurs in this CFA providing important ecological benefits to aquatic systems.

5. **Wetlands**
From a regional standpoint, there are no areas in the Northeast that support such extensive or high quality fresh and brackish tidal wetland systems as those in the Connecticut River estuary. The lower Connecticut River wetlands and river area consists of over 20 individual tidal wetland units and river islands of various sizes occurring along a 40-mile (64 kilometer) stretch of the lower Connecticut River from Old Saybrook to Cromwell. In particular, Whalebone Cove is one of the most undisturbed and biologically significant freshwater marshes along the Connecticut River (TNC 2013). Taken as a whole, the estuary represents a gradation of tidal wetlands from a very narrow zone of relatively high salinity marshes at the mouth of the Connecticut River where it enters Long Island Sound, through an intermediate zone of brackish, lower salinity wetlands, to extensive freshwater tidal marshes and floodplain forests beginning at Deep River and extending upriver to Cromwell (Comins personal communication 2013).

There are 455 acres of freshwater tidal emergent wetlands and 138 acres of shrub-swamp and floodplain forest at the mouth of creeks and within secluded coves of the Whalebone Cove CFA. Whalebone Cove has one of the largest stands of wild rice in the State. These tidal wetlands are part of the Connecticut River estuary, and provide habitat for a diversity of species. Further in land there are also 93 acres of scattered hardwood swamps.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers, coves) habitats, will focus on maintaining in-stream connectivity and outstanding water quality.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six, priority public uses, if determined compatible for the Whalebone Cove Division: wildlife observation, wildlife photography, environmental education, interpretation, hunting, and fishing.

## Were there other special considerations in delineating the CFA boundary?

The lower portion of the Eightmile River occurs in the CFA. Fifteen miles of the Eightmile River and its East Branch are included on the National Park Service's Nationwide Rivers Inventory of potential Wild and Scenic River segments. Both segments are included on the inventory for outstanding scenic, geologic, fish and wildlife values. In 2001, Congress passed Public Law 107-65 authorizing a study of the Eightmile River to determine if it meets established criteria for designation as an addition to the National Wild and Scenic River (WSR) System. This is the first step to formally including the River in the WSR. To date, Study partners have identified six criteria that make the Eightmile River a special natural resource:

(1) The presence of unique species of plants and animals, and unique natural communities.

(2) Outstanding water quality and quantity.

(3) Exemplary hydrology systems.

(4) Unique geology.

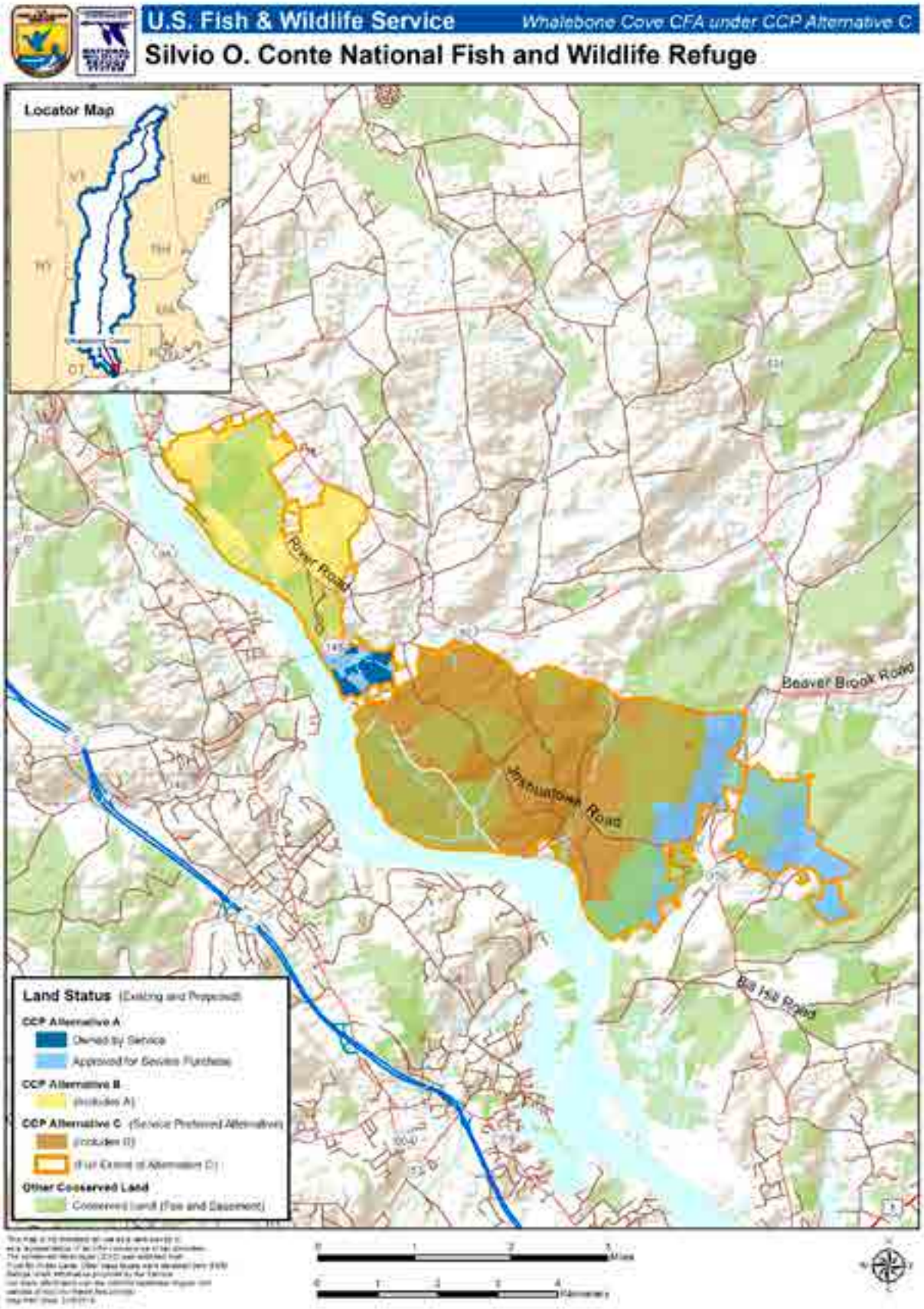
(5) An outstanding cultural landscape, including Native American settlement dating back to at least 6,000 to 4,000 BC, varied uses of the landscape since the time of European settlement, and its high potential for intact archaeological resources.

(6) An intact functioning watershed ecosystem.

The Eightmile River Watershed is a critical ecosystem in Connecticut. The River contains exceptionally high quality forest, aquatic, and early successional habitats that make it a critical region for birds and other wildlife in Connecticut. The Nature Conservancy and other groups collectively protect almost a quarter of the 40,000-acre watershed. The Eightmile River is located within the Lower Connecticut River Valley—a region named as one of the 40 Last Great Places in the Western Hemisphere by The Nature Conservancy in 1993. This area has also been designated a Ramsar wetland of international importance.

The Eightmile River represents a remarkably intact, free flowing and virtually unobstructed riverine ecosystem with excellent water quality and 85% forest cover. Because of the exceptional water quality and lack of migratory obstructions such as dams, the river system contains exceptional habitat for anadromous and catadromous fish species.

*Map A.15. Whalebone CFA – Location.*



*Map A.16. Whalebone CPA/CFA – Habitat Types.*

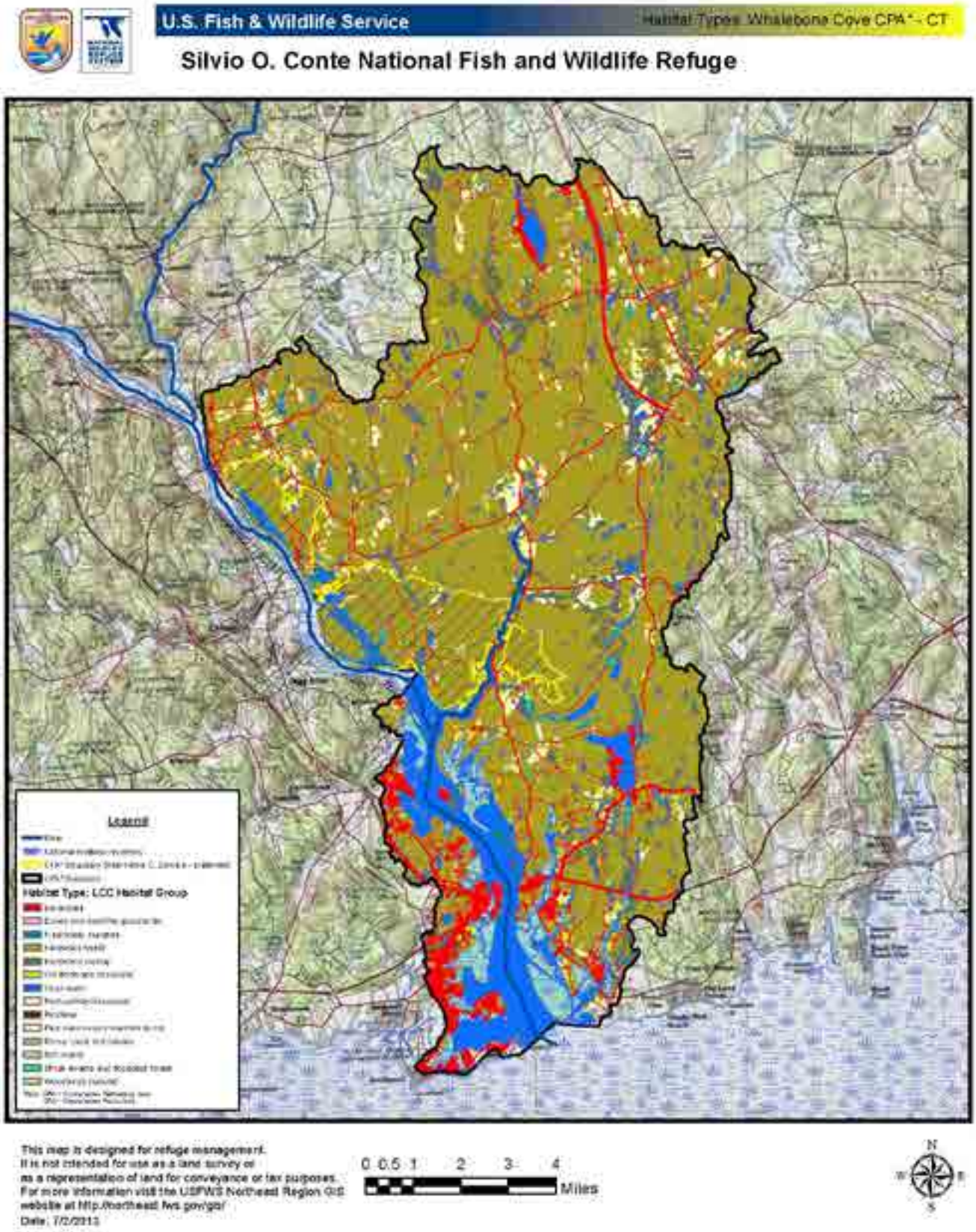


**Table A.14. Whalebone CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Hardwood forest | 54,447 | 66.2% | 5,607 | 2,546 | 0 | 80.5% | 10.3% |
| Hardwood swamp | 5,537 | 6.7% | 93 | 20 | 0 | 1.3% | 1.7% |
| Pine barrens and maritime | 89 | 0.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| Shrub swamp and floodplain forest | 603 | 0.7% | 138 | 94 | 0 | 2.0% | 22.9% |
| Woodlands (natural) | 13 | 0.0% | 2 | 0 | 0 | 0.0% | 18.6% |
| *Forested uplands and wetlands subtotal* | *60,689* | *73.8%* | *5,841* | *2,660* | *0* | *83.8%* | *9.6%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Freshwater marshes | 1,254 | 1.5% | 455 | 312 | 0 | 6.5% | 36.3% |
| Old fields and shrubland | 429 | 0.5% | 49 | 23 | 0 | 0.7% | 11.5% |
| Pasture/hay/grassland | 3,992 | 4.9% | 177 | 39 | 0 | 2.5% | 4.4% |
| Peatland | 15 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *5,689* | *6.9%* | *681* | *375* | *0* | *9.8%* | *12.0%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 5,645 | 6.9% | 170 | 57 | 0 | 2.4% | 3.0% |
| *Inland aquatic habitats subtotal* | *5,645* | *6.9%* | *170* | *57* | *0* | *2.4%* | *3.0%* |
| **Coastal non-forested uplands[9]** | | | | | | | |
| Dunes and maritime grasslands | 100 | 0.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky coast and islands | 56 | 0.1% | 42 | 33 | 0 | 0.6% | 74.6% |
| *Coastal non-forested uplands subtotal* | *156* | *0.2%* | *42* | *33* | *0* | *0.6%* | *26.7%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Coastal wetlands and aquatic habitats[9]** | | | | | | | |
| Salt marsh | 2,571 | 3.1% | 5 | 5 | 0 | 0.1% | 0.2% |
| *Coastal wetlands and aquatic habitats subtotal* | *2,571* | *3.1%* | *5* | *5* | *0* | *0.1%* | *0.2%* |
| **Other** | | | | | | | |
| Developed | 7,530 | 9.2% | 230 | 63 | 0 | 3.3% | 3.1% |
| *Other subtotal* | *7,530* | *9.2%* | *230* | *63* | *0* | *3.3%* | *3.1%* |
| **TOTAL** | **82,282** | **100.0%** | **6,967** | **3,192** | **0** | **100.0%** | **8.5%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.15. Whalebone Cove CFA – Preliminary Priority Refuge Resources of Concern**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 5,607 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Eastern Towhee[A,I]<br>Black-billed Cuckoo[I,J]<br>Broad-winged hawk[A,I,J]<br>Blue-winged Warbler[A,I]<br>Great-crested Flycatcher[A,I]<br>Hooded Warbler[I,J]<br>Sharp-shinned Hawk[I,J]<br>Yellow-throated Vireo[A,I,J]<br>**Eastern Red Bat[I]**<br>**Ovenbird[J]**<br>American Woodcock[A,I]<br>Gray Catbird[A,I,J]<br>Eastern Box Turtle[I]<br>Acadian Flycatcher[I,J]<br>Scarlet Tanager[A,I,J]<br>Black-and-white Warbler[A,I,J]<br>Baltimore Oriole[A,I,J]<br>Prairie Warbler[A,I]<br>Worm-eating Warbler[I,J]<br>Northern Flicker[A,I,J]<br>Cerulean Warbler[A,I,J]<br>Ruffed Grouse[I]<br>Whip-poor-will[A,I]<br>**Chestnut-sided Warbler[I]**<br>Migratory Species |
| **Louisiana Waterthrush**[A] | Breeding habitat includes contiguous (250+ acres) mature deciduous or mixedwood forests along medium to high-gradient, first to third-order, perennial streams (Mattsson et al. 2009, Degraaf et al., 2001). | |
| Blue-winged Warbler[A,B,I] | Breeding habitat includes fields scattered with shrubs and small trees, or young deciduous and mixed forests 1-20 years old (DeGraaf et al. 2001, Gill et al. 2001) | |
| New England cottontail[B, D] | Year round habitat includes dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | |
| Bald Eagle[C, G]<br><br>Osprey[G] (breeding and migrating only) | Breeding, migrating and wintering habitat includes large bodies of open water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf et al. 2001). | |
| **Hardwood Swamp[5] - 93 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-Central Interior and Appalachian rich swamp[H] | Eastern hemlock is usually present and may be dominant in the *North-Central Appalachian acidic swamp system*. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-Central Interior and Appalachian rich swamps* are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include red maple, black ash, as well as calcium loving (calciphilic) herbs. Conifers include American larch, but typically not Northern white cedar, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 138 acres** | | |
| New England cottontail[B, D] | Year-round habitat includes shrub swamps of at least 25 acres that are within 1 km of other shrub swamps, and early successional forest patches (Arbuthnot 2008, DeGraaf et al. 2001). | American Redstart[I,J]<br>Gray Catbird[A,I,J]<br>Chestnut-sided Warbler[I]<br>Migratory Species<br>**Willow Flycatcher[A, I]**<br>American Woodcock[A,I]<br>Rusty Blackbird[A]<br>**Warbling Vireo[I]**<br>**Spotted Turtle[I]**<br>Eastern Kingbird[A,I,J] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Woodlands (natural)[5] - 2 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 455 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). Wintering habitat includes open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging, as well as tidal wetlands (DeGraaf et al. 2001) | Northern Harrier[I,J]<br>Wood Duck[A,I,J]<br>Green-winged Teal[A,I ,J]<br>Great Blue Heron[I]<br>**American Bittern[A,I]**<br>Bufflehead[A]<br>Canada Goose, NAP[A,J]<br>Canada Goose, AP[A,J]<br>**Virginia Rail[I]**<br>**Marsh Wren[A,I]**<br>Mallard[A,I,J]<br>Lesser Yellowlegs[A,J] |
| Snowy Egret[A,C,I,J] | Foraging habitat includes shallow pools, freshwater wetlands, and tidal flats within the vicinity of nesting areas (DeGraaf et al. 2001). | |
| **Old Fields and Shrublands[5] - 49 acres** | | |
| New England Cottontail[B, D] | Year round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (Arbuthnot 2008, DeGraaf et al. 2001). | American Woodcock[A,I,J]<br>Eastern Towhee[A,I]<br>Gray Catbird[A,I]<br>**Bobolink[I]**<br>**Eastern Meadowlark[I]**<br>**Blue-winged Warbler[A,I]**<br>Prairie Warbler[A,I]<br>**Brown Thrasher[A,I]**<br>**Field Sparrow[A,I]**<br>Eastern Kingbird[A,I]<br>Chimney Swift[A,I]<br>Northern Harrier[I,J]<br>Indigo Bunting[I,J]<br>Migratory Species |
| Blue-winged Warbler[A,B,I] | Breeding habitat includes fields scattered with shrubs and small trees, or young deciduous and mixed forests 1-20 years old (DeGraaf et al. 2001, Gill et al. 2001) | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland[5] – 177 acres** | | |
| New England Cottontail[B, D] | Year round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of eachother (Arbuthnot 2008, DeGraaf et al. 2001). | American Woodcock[A,I,J]<br>Eastern Towhee[A,I]<br>Gray Catbird[A,I]<br>**Bobolink[I]**<br>**Eastern Meadowlark[I]**<br>**Blue-winged Warbler[A,I]**<br>Prairie Warbler[A,I]<br>**Brown Thrasher[A,I]**<br>**Field Sparrow[A,I]**<br>Eastern Kingbird[A,I]<br>Chimney Swift[A,I]<br>Northern Harrier[I,J]<br>Indigo Bunting[I,J]<br>Migratory Species |
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] – 170 acres** | | |
| Blueback Herring[F, G] | Spawn in fast moving, shallow water when the river temperature is about 58 F (USFWS 1996). | Sea Lamprey[I]<br>Bridle Shiner[I]<br>Pumpkinseed[I]<br>Striped Bass[I]<br>Longnose Dace[I]<br>Yellow Perch[I]<br>Banded Sunfish[I]<br>White Perch[I] |
| Alewife[B, F, G] | Spawn in ponds and slow-moving streams (USFWS 1996). | |
| Brook Trout[F] | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | |
| American Eel[E, F] | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | |
| American Black Duck[A, B, C, G] | Migrating and wintering habitat includes open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging (DeGraaf et al. 2001). | Canada Goose, Atlantic[A]<br>Canada Goose, North Atlantic[A]<br>**Bufflehead[A]**<br>Mallard[A]<br>Snowy Egret[A,I,J]<br>Bald Eagle[A,I]<br>Wood Duck[A]<br>Green-winged Teal[A] |
| **Coastal Non-forested Uplands[4]** | | |
| **Rocky Coast and Islands[5] – 42 acres** | | |
| Acadian-North Atlantic rocky coast[H] | This system encompasses non-forested uplands that are often a narrow zone between the high tide line and the upland forest; this zone becomes wider with increasing maritime influence. The substrate is rock, sometimes with a shallow soil layer, and tree growth is prevented by extreme exposure to wind, salt spray, and fog. Slope varies from flat rock to cliffs. Cover is patchy shrubs, dwarf-shrubs and sparse non-woody vegetation, sometimes with a few stunted trees. Many coastal islands have grass-shrub areas that were maintained by sheep grazing and now persist even after grazing has ceased (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Coastal Wetlands and Aquatic Habitats[4]** | | |
| **Salt marsh[5] – 5 acres** | | |
| Northern Atlantic coastal plain tidal salt marsh[H] | This system encompasses intertidal marshes where salinity levels are between 5 and 50 (ppt). It includes a number of different broad vegetation types including salt pannes (depressions within a salt marsh that flood during high tide), salt marshes, and salt shrublands. The typical salt marsh profile, from sea to land, can be summarized as follows: a low regularly flooded marsh strongly dominated by smooth cordgrass; a higher irregularly flooded marsh dominated by salt meadow cordgrass and sea shore saltgrass; low hyper-saline pannes characterized by glasswort spp.; and a salt scrub ecotone characterized by Jesuit's bark, eastern baccharis, and switchgrass. Moving up a tidal river, brackish marshes have less cover of salt meadow cordgrass and increased cover of associated species including tall grasses such as chair maker's bulrush and narrow-leaf cattail (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Connecticut Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Whalebone Cove CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, Louisiana waterthrush, New England cottontail, blue-winged warbler, osprey, and bald eagle.

***Rationale:***
We envision healthy forests within the Whalebone Cove CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Connecticut wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Whalebone Cove CFA hardwood forests are among the most diverse and productive for wildlife, and abundant, high-quality habitat is certainly available within the CFA. To date our review of the Whalebone Cove CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Whalebone Cove comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Whalebone Cove are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For many species, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Whalebone Cove will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. The USFWS New England cottontail initiative has identified focus areas, including the Whalebone Cove CFA, where the decline in early successional habitats is a particular problem for the New England cottontail. New England cottontail is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of fifteen or more habitat patches, several of which are 25 acres or more. Each habitat patch should be one mile or less from each other to aid in New England cottontail movement between patches (Fuller and Tur 2012). Approximately 375 acres of forest will be managed in early successional habitat in support of New England cottontail in the CFA. Another species of conservation concern that will use these habitat patches is American woodcock. High quality woodcock habitat includes young forest patches within a mile of feeding areas. New England cottontail habitat patches will be placed in the vicinity of shrub wetlands, where feasible, to benefit this species. If early successional habitat is lacking within the landscape, we will provide other strategically located patches with these conditions to support other species of conservation concern such as blue-winged warbler, chestnut-sided warbler, gray catbird, eastern towhee, black and white warbler, eastern red bat, and ruffed grouse (DeGraaf et al. 2006).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Hardwood forests within the Whalebone Cove CFA should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and Louisiana waterthrush. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Louisiana waterthrush prefer a dense, multilayer forest canopy—particularly along high-gradient streams—for protection from nest predation.

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, acadian flycatcher, and—when along rocky bottomed streams—Louisiana waterthrush. Efforts to regenerate any portion of forest within the CFA must account for the abundance of invasive understory species and risk of regeneration failure from white-tailed deer overbrowsing (Hochholzer 2010).

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the sharp-shinned hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy— provide special habitats that, when near open bodies of water, are utilized by bald eagles and osprey. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, barred owls, and woodpeckers, like the northern flicker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners and adjacent landowners to identify areas appropriate for New England cottontail management. Plan to manage approximately 375 acres of forest in early successional habitat for New England cottontail in the CFA. This approximation of the amount and distribution of acreage over the next 15 years assumes we would have a large enough land base to manage. Our target acreage may also be refined once site conditions are verified and a habitat management plan is completed.

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices.

- Protect hard and soft mast producing species such as American beech, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

**Sub-objective 1.1b. (Shrub Swamps and Floodplain Forests)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide habitat for priority refuge resources of concern including American black duck and New England cottontail.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Our coarse-scale habitat analysis of this CFA identifies shrub swamps scattered in pockets across the CFA, but appear to be more concentrated in a wetland complex, consisting of shrub swamp and freshwater marsh communities, at the mouth of Joshua and Whalebone Creeks, and on the perimeter of Selden Creek and Chapman Pond. These tide influenced wetlands, and those that are not influenced by tide events, provide a diversity of plant communities, and habitats for a variety of wildlife species, including American black duck and, potentially, New England cottontail.

New England cottontail is a candidate species for listing under the Endangered Species Act, and is a species of greatest conservation need in Connecticut. The historic range of this species likely included southeastern New York, north through the Champlain Valley and into southern Vermont, New Hampshire, and Maine, and statewide in Massachusetts, Connecticut, and Rhode Island. Due to loss of early successional habitat to development and forest maturation, this species occupies less than a fifth of its historical range (Fuller and Tur 2012). New England cottontail is no longer sustaining a viable population, and given this conservation urgency, a range-wide New England cottontail Initiative was established. This initiative involves collaboration from multiple agencies, including the USFWS, state wildlife agencies, Universities, Natural Resources Conservation Service, The Nature Conservancy, and Wildlife Management Institute, to address cottontail conservation on a landscape scale.

Focus areas were identified as locations to manage and restore habitat for New England cottontail. The Whalebone Cove CFA was one of forty-nine focus areas in six states. Early successional management and protection of adjacent natural shrubland habitat, such as shrub swamps, will meet the conservation goals set for the New England cottontail. “A Conservation Strategy for the New England cottontail” was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller et al 2012).

American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 30. Black ducks use wetlands, including shrub swamp communities, as stopover habitat during migration, and as breeding and wintering habitat. Well-concealed nests are placed on the ground in nearby uplands or hummocks in wetlands, and adults and their broods forage on seeds, aquatic vegetation and invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). Open water habitat, and the adjacent wetland complex provides excellent wintering and migrating habitat for American black ducks. And located on the Connecticut River, an important migration corridor, these wetland communities are used by other waterfowl species during migration including green-winged teal, common merganser, mallards, bufflehead, and wood ducks.

Due to our unfamiliarity with habitat conditions in the CFA, management of this wetland complex will first require a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale (shrub swamps), but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA. Baseline information on the condition of these wetlands at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- If appropriate, incorporate shrub swamps into the network of habitat patches required for New England cottontail.
- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and

species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Whalebone Cove CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples

## Objective 1.2: Non-forested Uplands and Wetlands

### Sub-objective 1.2a. (Freshwater Marsh)

Manage freshwater marshes to support natural and rare ecological communities, and provide habitat for priority refuge resources of concern including American black duck, and waders such as snowy egret, and rails.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush,

jewelweed, marsh fern, water lily, and narrow-leaved cattail (Gawler 2008). Our coarse-scale habitat analysis of this CFA identifies a wetland complex, consisting of shrub swamp and freshwater marsh communities, at the mouth of Joshua and Whalebone Creeks, and on the perimeter of Selden Creek and Chapman Pond. These tide influenced wetlands provide a diversity of plant communities, and habitats for a variety of wildlife species, including American black duck, long-legged waders such as snowy egret and rails. Please see sub-objective 1.2a for a detailed discussion on shrub swamp communities, and priority resources of concern.

American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 30. Black ducks use wetlands, including freshwater marsh communities, as stopover habitat during migration, and as breeding and wintering habitat. Well-concealed nests are placed on the ground in nearby uplands or hummocks in wetlands, and adults and their broods forage on seeds, aquatic vegetation and invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). Open water habitat, and this adjacent wetland complex provides excellent wintering and migrating habitat for American black ducks. And located on the Connecticut River, an important migration corridor, these wetland communities are used by other waterfowl species during migration including green-winged teal, common merganser, mallards, bufflehead and wood ducks.

These freshwater marsh habitats also provide important habitat for waders, such as snowy egrets and lesser yellow legs, and rails including Virginia rail. Snowy egrets are one of thirteen target species to benefit from conservation actions within large freshwater wetland habitats in BCR 30 (Steinkamp, Melanie 2008). This species is also a state species of conservation concern. Egrets use the CFA freshwater wetlands as foraging areas, and may be important for post-nesting dispersals (P. Comins personal communication 2010).

Due to our unfamiliarity with habitat conditions in the CFA, management of this wetland complex will first require a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale (freshwater marsh), but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA. Baseline information on the condition of these wetlands at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Evaluate wetland hydrology for impacts to natural flow regimes.
- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Inventory wetland plant communities.
- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland and Old Fields and Shrublands)**
Provide appropriate conditions within current pasture, hay, and grassland acreage, and old field and shrubland habitat that will support New England cottontail (where appropriate), and other shrub-dependent conservation concern species such as blue-winged warbler.

***Rationale:***
Over two percent of the Whalebone Cove CFA is typed as pasture, hay, grassland, old fields and shrublands. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses, while shrubs dominate shrublands, and a mixture of shrubs and grasses tend to occur in old fields.

Many bird species of conservation concern rely on these habitats, including grassland dependent species such as bobolink and grasshopper sparrow, and shrub dependent species such as blue-winged warbler, prairie warbler, field sparrow, American woodcock, and chestnut-sided warbler. Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occur in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Another species of conservation concern that uses shrubland dominated habitat is New England cottontail. This species is petitioned for listing under the ESA, and is a species of greatest conservation need in Connecticut. The Whalebone Cove CFA is a New England cottontail Focus Area, which are areas identified as locations to manage and restore habitat for New England cottontail. New England cottontail require early successional habitat (dense shrubs and tree saplings). The pastures, hay fields, and grasslands within the CFA, if allowed to revert to woody stems, will provide this habitat with very little initial manipulation.

The conceptual model for the conservation of New England cottontail is for a focus area to contain at least 1,000 acres of early successional habitat of fifteen or more habitat patches, several of which are 25 acres or more. Each habitat patch should be one mile or less from each other to aid in New England cottontail movement between patches (Fuller and Tur 2012). Where appropriate, pastures, hay fields, grasslands, shrublands, and old fields will be incorporated into the network of patches managed for New England cottontail by allowing woody stem colonization.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, grassland, old fields and shrubland acres can provide quality habitat if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Whalebone Cove CFA to benefit priority refuge resources of concern including American eel, alewife, blueback herring, Atlantic sturgeon and brook trout, as well as other species of conservation concern such as sea lamprey. Also provide undisturbed wintering and stopover habitat for American black duck, and other waterfowl.

***Rationale:***
Whalebone Cove CFA aquatic habitats are among the highest in quality of the shallow fresh water bays, coves, tidal creeks, and tributaries which typify the Lower Connecticut River and the significant overwintering, spawning and feeding habitat they provide for a large number of fish species. Many species of conservation concern use these aquatic habitats including American eel, alewife, Atlantic sturgeon, blueback herring, brook trout and sea lamprey.

Many of the tidally influenced coves and creeks, including Whalebone cove, and Whalebone and Joshua creeks, provide important spawning habitat for alewife and blueback herring. The creeks also provide excellent nursery habitat for these species. American eel, a species petitioned for federal listing, spend the majority of their young life in the freshwater systems of this CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Juvenile Atlantic sturgeon were recently documented in the lower portion of the Connecticut River (S. Gephard, CTDEEP, personal communication 2015). This Federal endangered species and a species of greatest conservation need in Connecticut, were once considered extirpated in the Connecticut River, as reproduction no longer occurred in the main stem (Sprankle personal communication 2014). The documentation of juveniles provides a higher probability and opportunities for recovery of this species in the Connecticut River.

Brook trout occur in the upland portions of the CFA, where free-flowing cold water habitat is present, and a requirement for this species life cycle. Brook Trout are a species of conservation concern due to habitat loss and potential impacts from climate change. This species is present in the tributaries to Eightmile, and Chapman Pond.

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems, their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

The open water habitat within the various coves, rivers, creeks and wetlands provide excellent wintering and stopover habitat for American black duck. Other migratory waterfowl also take advantage of these secluded areas including green-winged teal, common merganser, mallards, bufflehead and wood ducks. This open water habitat also supports foraging opportunities for bald eagles and osprey.

The aquatic habitats in the Whalebone Cove CFA are diverse, and provide habitat for a variety of wildlife species. Development and human activities have impacted water quality and infringed on aquatic species movements and life cycles. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 10 years of approval:*

- Work with partners to protect and increase “hard bottom” (e.g., gravel, cobble, or bedrock) for spawning aquatic species.
- Work with partners to reduce combined sewer overflow.

**Inventory and Monitoring Strategies:**
*Within 5 years of approval:*

- Work with partners to conduct stream assessments to evaluate stream and fish community health.
- Work with partners to conduct a physical and biological assessment of Whalebone Cove.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

**Sub-objective 1.4a. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges’

"biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and slow moving streams and pools in wetland ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Whalebone Cove CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger upland and wetland matrix, and providing additional structural and species diversity to the matrix. Rocky shorelines along large river systems and wet meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these meadows are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including CTDEEP in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

**Sub-objective 1.5a. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
See the rationale for objective 1.4a.

Habitats that occur within the Whalebone Cove CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky shorelines along large river systems and wet meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these meadows are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Connecticut, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Whalebone Cove Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Whalebone Cove Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Whalebone Cove Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Whalebone Cove Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Whalebone Cove Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Whalebone Cove Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Whalebone Cove Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Whalebone Cove Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Whalebone Cove Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Whalebone Cove Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Whalebone Cove Division is unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
The Whalebone Cove Division is comprised of floodplain forests and wetlands adjacent to the Connecticut River, offering good hunting opportunities for waterfowl, small game, and white-tailed deer. Public hunting areas in the vicinity include Selden Neck State Park. Hunting, consistent with the final compatibility determination, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

- Consult with Connecticut Department of Energy and Environmental Protection, Hunting Review Team in evaluating the suitability of new acquisitions to support a safe, manageable hunt program.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*
- Work with Connecticut Department of Energy and Environmental Protection to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with Connecticut Department of Energy and Environmental Protection to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land sufficient land to support hunting seasons:*
- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Whalebone Cove Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring land sufficient land to support hunting seasons:*
- Work with Connecticut Department of Energy and Environmental Protection to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Whalebone Cove Division after completing all administrative procedures to officially open refuge lands to fishing, consistent with the final compatibility determination, based on Connecticut Department of Energy and Environmental Protection regulations, and any division-specific conditions.

***Rationale:***
Fishing would be allowed on a newly created division, consistent with the final compatibility determination. The principal fishing resources on this CFA are the Connecticut River and the Eightmile River, although there are several other smaller streams that support game fish. However, some of these streams are difficult to access. Most people fish the Connecticut River from boats, but allowing bank fishing on the Whalebone Cove Division, where it can be done safely and not significantly impact resources, would provide the public with another recreational opportunity. Fishing is a popular activity in this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Whalebone Cove Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land with fishable waters:*

- Work with the Connecticut Department of Energy and Environmental Protection to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, Web site pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities, if these activities are found to be compatible uses.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity. Opening acquired land in this new division to wildlife observation and photography will provide visitors a chance to see and photography a variety of wildlife species in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of CCP approval:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of CCP approval:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of CCP approval:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge visitor services plan.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Whalebone Cove Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that are part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Whalebone Cove Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that are part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Whalebone Cove Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on the determination that the use is both appropriate and compatible.)

*Within 1 year of CCP approval:*

- Allow dispersed hiking, snowshoeing, and cross country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Allow canoeing and kayaking in acquired coves and waterways.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Dead Man's Swamp Unit (Existing Refuge Unit)

## Cromwell, Connecticut

| Total Unit Acres[1] | 31 |
|---|---|

[1]Actual acres

## What are the priority habitat types within the unit?

- Hardwood forest - 25%
- Hardwood Swamp – 49%
- Freshwater Marsh – 7%
- Open water – 17%

For more information on the unit's habitats, see map A.18 and table A.16.

## What are the Federal trust and other natural resource values in the unit?

1. **Endangered Species**
   The Puritan tiger beetle, a federally listed species, uses beach habitat on the south end of the Dead Man's Swamp Unit along the Connecticut River. Beetles also utilize beach habitat adjacent to the northern portion of the unit, which is privately owned. The river flow dynamics of the Connecticut River creates open sandy beaches that are required for breeding beetles. Encroachment of herbaceous and woody plants reduces suitable larval habitat and because of this there has been periodic vegetation control on this unit.

   Both populations are monitored by the State. A site visit with partners in 2011, determined that vegetation and silt are impacting tiger beetle populations on the southern portion of the Unit, and very few adults have been observed. Removal of this vegetation will be necessary to provide appropriate tiger beetle habitat. The beach habitat adjacent to the north end of the unit is expanding, and beetle numbers are increasing, though recreational activities may impact recovery.

   Recovery criteria in the USFWS Puritan Beetle Recovery Plan specifies a minimum of three meta-populations, at least two of which are large (500 to 1000 or more adults) are maintained or established (i.e., self-maintained for at least 10 years) within the species historical range along the Connecticut River, and habitat they occupy is permanently protected (Hill and Knisley 1993). We will continue to work with partners in the recovery of Puritan tiger beetle populations in the Connecticut River.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor for bird species. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). Dead Man's Swamp Unit abuts the Connecticut River, and though small in acreage, the forest and wetlands are important stopover habitat for landbirds.

3. **Waterfowl**
   The coves adjacent to the Dead Man's Swamp may provide important stopover areas for migrating and wintering waterfowl.

4. **Diadromous fish and other aquatic species**
   The Dead Man's Swamp Unit is adjacent to the Connecticut River which provides important habitat for American shad, shortnose sturgeon, American eel, alewife, blueback herring, and Atlantic salmon.

5. **Wetlands**
   There are 15 acres of hardwood swamp and 2 acres of freshwater marsh on the unit. These wetland acres are adjacent to the Connecticut River, and are part of its floodplain.

## What habitat management activities would likely be a priority on refuge lands within the unit?

We will conduct a comprehensive, multi-scale wildlife habitat inventory. Baseline information on the condition of habitats will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on the following:

- Work with partners to maintain beach habitats, and monitor Puritan tiger beetle populations.
- Manage invasive plants in the floodplain forest to maintain native diversity.

## What public use opportunities would likely be a priority on refuge lands within the unit?

The Dead Man's Swamp Unit is closed to the public to protect the federally threatened Puritan tiger beetle.

## Does the unit have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

As mentioned above, the Dead Man's Swamp Unit supports the federally threatened Puritan tiger beetle.

*Map A.17. Dead Man's Swamp Unit – Location.*

*Map A.18. Dead Man's Swamp Unit – Habitat Types.*

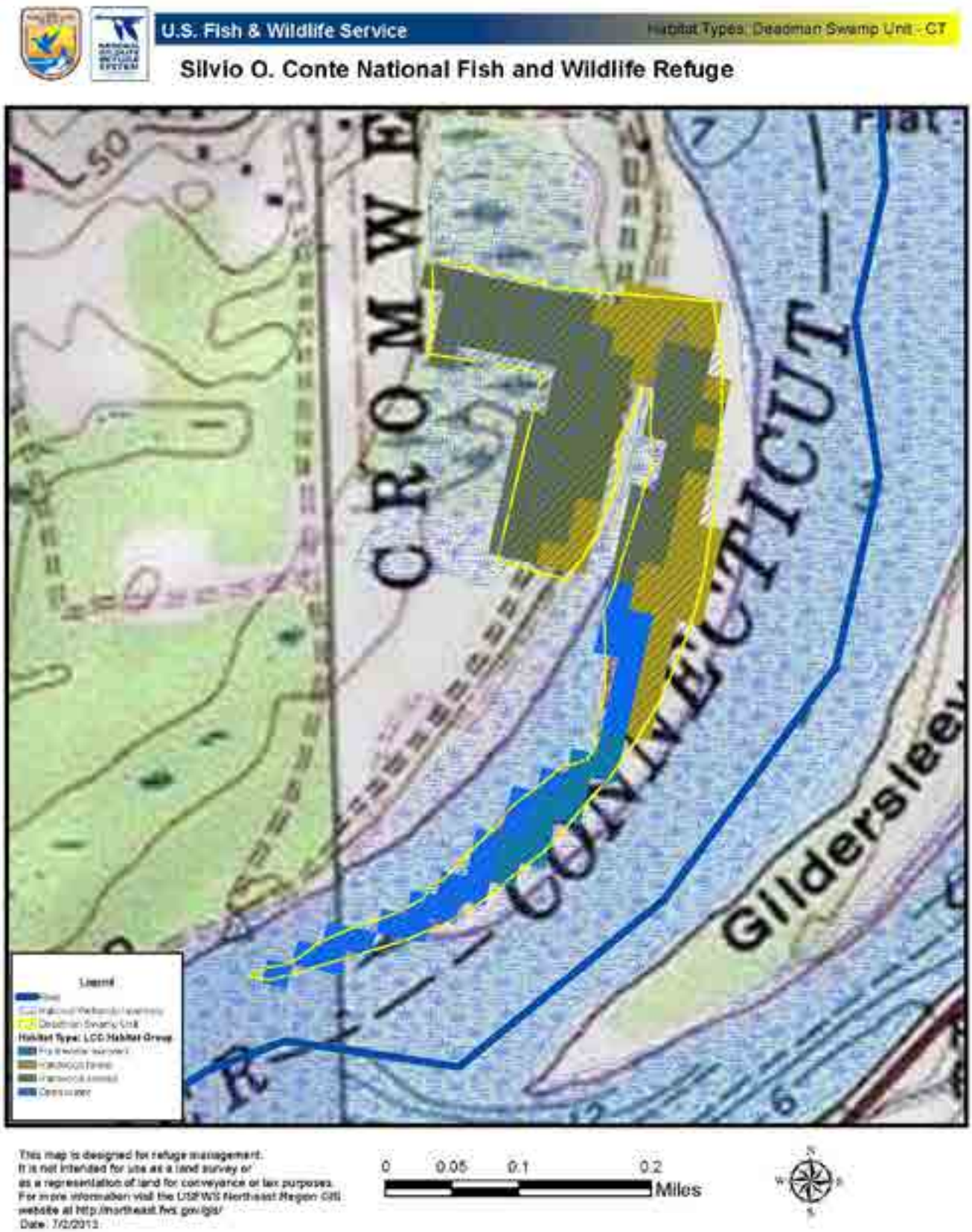


**Table A.16. Dead Man's Swamp Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 8 | 25.5% |
| Hardwood swamp | 15 | 49.6% |
| *Forested uplands and wetlands subtotal* | *23* | *75.2%* |
| **Non-forested Uplands and Wetlands[2]** | | |
| Freshwater marshes | 2 | 7.3% |
| *Non-forested uplands and wetlands subtotal* | *2* | *7.3%* |
| **Inland aquatic habitats[2]** | | |
| Open Water | 5 | 17.5% |
| *Inland aquatic habitats subtotal* | *5* | *17.5%* |
| **TOTAL** | **30** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Dead Man's Swamp Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Dead Man's Swamp's small size and isolation from other refuge units, has led us to aggregate our objectives and discussion under a single sub-objective that addresses the Unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. The Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines Unit management that will benefit many species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Dead Man's Swamp Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats, by virtue of refuge land ownership, represent small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and provide additional structural and species diversity to the matrix. A riverine sand spit along the Connecticut River main stem or a central hardwood swamp, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sand and clay deposits for larval Puritan tiger beetles, or quaking swamps for secretive bird species. One could make the case that these habitats are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context.

Some habitats within the Unit will be managed under a fine filter approach—primarily those areas where the Federally-listed Puritan tiger beetle has been documented. USFWS policy requires species-specific management efforts in the case of rare, threatened, or endangered species (see sub-objective 1.3a).

Combining coarse and fine-scale conservation efforts under the rubric of BIDEH will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually, and more targeted strategies for those rare, threatened, or endangered species like the Puritan tiger beetle. Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 3 years of CCP approval*

- Work with partners to develop and begin implementation of actions to conserve the existing Puritan tiger beetle metapopulation that includes the Deadmans Swamp Unit. This should include identifying potentially suitable sandy beach habitat, land protection options for suitable habitats, actions that will contribute to recovery, and management of Service lands to complement tiger beetle recovery efforts.

*Within 5 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories
- Map natural communities; protect rare or exemplary examples

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water and River Shore)**
In collaboration with partners, identify and implement habitat restoration opportunities to provide sparsely vegetated or open sandy beaches for Puritan tiger beetles.

***Rationale:***
The Puritan tiger beetle was listed as threatened by the U.S. Fish and Wildlife Service on August 7, 1990 due to declining range and threats from habitat loss and degradation. There are two metapopulations, one on the Chesapeake Bay in Maryland and the other in New England. The recovery of the New England population requires at least three metapopulations, two of which must be large (i.e. 500 to 1,000+ adults) (USFWS 1993). Currently, there is a single metapopulation in Cromwell, Connecticut that meets this criterion occupying four satellite sites; three of which are privately owned and not protected. The fourth site was purchased by the Service in 2005 as the Deadman's Swamp Unit of the Conte Refuge.

This metapopulation been are monitored by by CT DEEP since 1991 and appears to be stable, but has not expanded. A site visit with partners in 2011, determined that vegetation and silt are impacting tiger beetle populations on the southern portion of the Unit, and very few adults have been observed. Removal of this vegetation will be necessary to provide appropriate tiger beetle habitat.

The Service contracted surveys in Connecticut to evaluate potentially suitable habitat for reintroductions (Kapitulik 2009). Of the surveyed sites, Higganum Meadows and Windsor Islands, both owned by the state are considered suitable for reintroduction. These sites, along with proven larval translocation protocols, offer an opportunity to establish two additional metapopulations as required by Recovery Criterion 3 (USFWS 1993). We will continue to work with partners to manage habitats to maintain and increase tiger beetles at the Cromwell location and take steps to establish two additional Connecticut metapopulations.

**Management Strategies:**
*Continue to:*

- Work with partners to manage beach habitats to benefit Puritan tiger beetles which includes hand-pulling or herbicide application to encroaching vegetation in Puritan tiger beetle larval habitat.
- Continue to support Puritan tiger beetle research opportunities.

**Inventory and Monitoring Strategies:**
*Continue to:*

- Work with partners to monitor Puritan tiger beetle populations.
- Work with partners to educate the general public about recreational use impacts on Puritan tiger beetle populations using outreach, visitor contact, restricted access and other tools, as warranted.
- Partner with CT DEEP and other partners to establish two additional meta-populations as called for in the Recovery Plan.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

*This goal is not applicable to this unit because it is closed to all public access, except by special use permit, to protect the federally threatened Puritan tiger beetle.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

*This goal is not applicable to this unit because it is closed to all public access, except by special use permit, to protect the federally threatened Puritan tiger beetle.*

# Overview
# Roger Tory Peterson Unit (Existing Refuge Unit)

## Old Lyme, Connecticut

| Total Unit Acres[1] | 56 |
|---|---|

[1]Actual acres

## What are the priority habitat types within the proposed unit? What percentage of the total unit acreage do they represent?

- Hardwood forest - 89%
- Salt marsh – 3%

**What are the Federal trust and other natural resource values in the unit?**

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Roger Tory Peterson Unit is in close proximity to the Connecticut River, and though small in acreage, the forest and wetlands are important stopover habitat for land birds.

## What habitat management activities would likely be a priority on the unit?

- Manage invasive plants to maintain native diversity.

## What public use opportunities would likely be a priority on the unit?

The main focus our visitor services program at this unit would be interpretation and wildlife observation and photography. We plan to work with partners to develop interpretive materials about Roger Tory Peterson and his importance as a naturalist, educator, ornithologist, and wildlife artist. We also plan to construct an ADA-accessible nature trail on the unit.

## Does the unit have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

The unit contains a small house that served as Roger Tory Peterson's office and an adjacent small garage. Peterson was a renowned naturalist, ornithologist, artist, and educator, best known for his series of successful nature field guides.

*Map A.19. Roger Tory Peterson Unit – Location.*

*Map A.20. Roger Tory Peterson Unit – Habitat Types.*

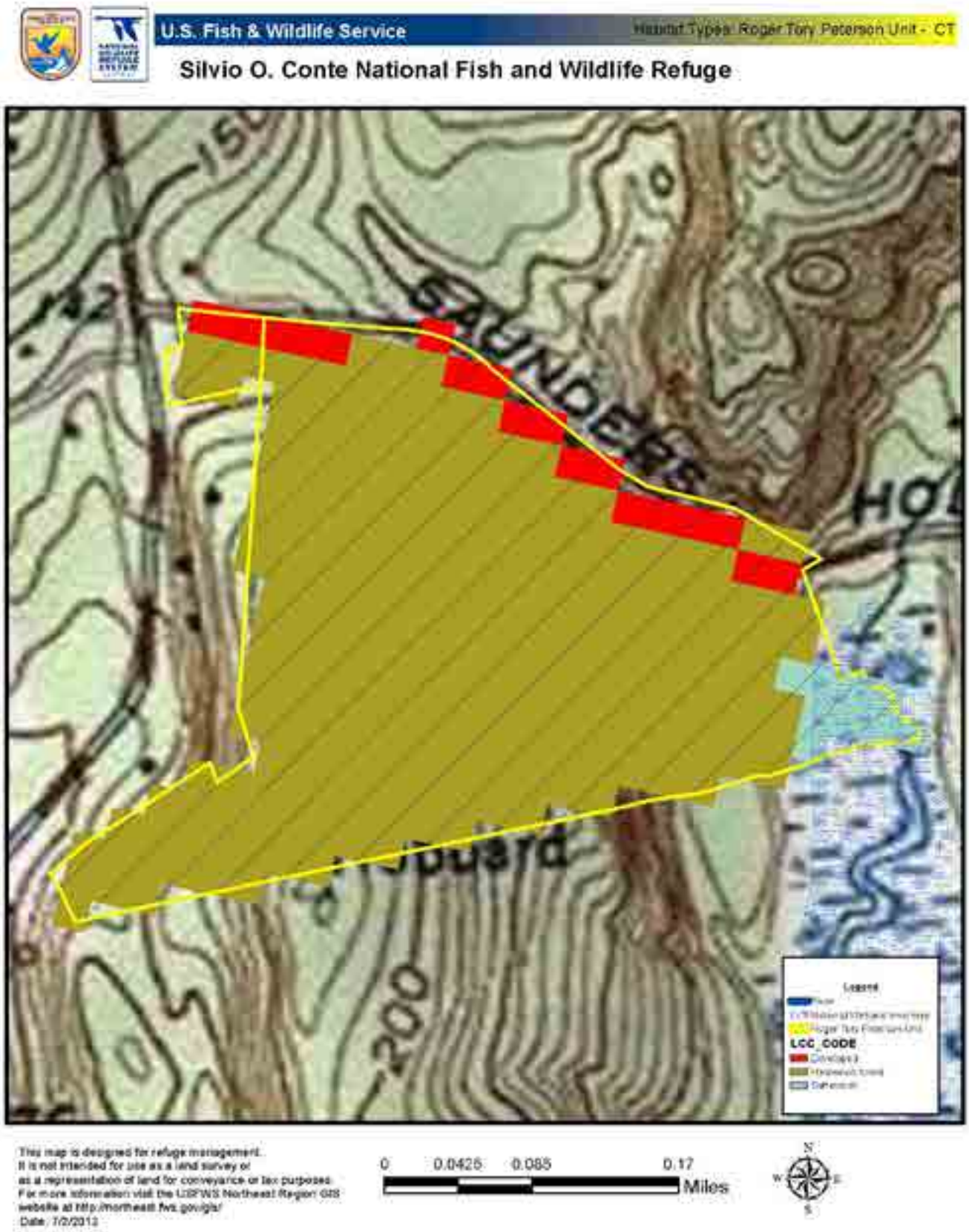


**Table A.17. Roger Tory Peterson Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested uplands and wetlands[2]** | | |
| Hardwood forest | 50 | 89.3% |
| *Forested uplands and wetlands subtotal* | *50* | *89.3%* |
| **Coastal wetlands and aquatic habitats[2]** | | |
| Salt marsh | 2 | 3.6% |
| *Coastal wetlands and aquatic habitats subtotal* | *2* | *3.6%* |
| **Other** | | |
| Developed | 4 | 7.1% |
| *Other subtotal* | *4* | *7.1%* |
| **TOTAL** | **56** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Roger Tory Peterson Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
The Roger Tory Peterson Unit's small size and isolation from other refuge units has led us to aggregate our objectives and discussion under a single sub-objective that addresses the unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. The Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Roger Tory Peterson where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Salt marsh and rocky outcrops, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or tidal waters that support brackish grasses and plants. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. The same is true when the refuge may own a limited example of a larger ecosystem, as in the case of the salt marsh within the Unit. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Work with partners, including the State of Connecticut, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Monitor impacts to sensitive habitats from the introduction of trail users.

## Goal 2: Education, Interpretation, and Outreach: Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

### Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Provide support to the Friends group who will act as a resource to communities, school systems, public and non-profit organizations, and private educational organizations in Connecticut, who want to use the Peterson Unit as an outdoor environmental education classroom.

***Rationale:***
The 56-acre Peterson Unit was once owned by renowned naturalist, Roger Tory Peterson. Located in Old Lyme, Connecticut, the site offers visitors a chance to see hardwood forests mixed with riparian wetlands along the western boundary of the Lieutenant River. Located on the property is a small house, the York House, used by Roger Tory Peterson as an office. The forming Friends group, and local residents would like to see this site developed into a small visitor contact station to interpret the life and work of Roger Tory Peterson, as well as the larger Conte Refuge. The refuge supports this vision.

Environmental education is an important tool that can be used to spread the refuge message to private residents throughout the watershed, including to residents surrounding the Peterson Unit in Connecticut. The Peterson Unit has a small house on it, the York House, which was once used by Roger Tory Peterson as an office. This facility will be able to host students from the surrounding area participating in environmental education and educate them not only about refuge purposes, but also about the work of Roger Tory Peterson, a great naturalist. Because the Peterson Unit does not have full time visitor services staff, most environmental education efforts will be conducted through volunteers, Friends members, and partners.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Develop a cadre of volunteers and partners that can lead educational visits from local schools.
- Promote the Peterson Unit as a destination for field trips and increase the number of students by two percent per year for the next 5 years.
- Develop educational partnerships with at least one local school to use the unit as an outdoor classroom emphasizing migratory birds, the Peterson legacy, hardwood forests, and riparian areas.
- Encourage partners to develop an evaluation system to measure the effectiveness of environmental education programs.
- Encourage and support Friends group to work with local schools to develop experiential learning programs focusing on hardwood forests, riparian wetlands, the Peterson legacy, and migratory birds that contribute to Connecticut curriculum standards.
- Make environmental education training available to volunteers and Friends group members.

*Within 10 years of CCP approval:*

- Offer the Peterson Unit as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Promote other government agencies, non-profit organizations, private educational organizations, staff, volunteers, and members of the Friends of Peterson to offer high quality EE programs at the Peterson Unit.

***Rationale:***
See rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work through volunteers and members of Friends group to facilitate teachers and students at the Peterson Unit.
- Work with local environmental education providers to implement the refuge's Adopt-a-Habitat initiative to help individuals learn about and connect with their local environments;
- Work with Friends of Conte Recreation and Education sub-committee to support and recruit partners that seek funding for watershed-based environmental education.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
Encourage and support Friends group to work with communities, public and non-profit organizations, staff, and volunteers to offer quality interpretive programming at the Peterson Unit. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. The Peterson Unit will provide ample opportunities to not only interpret the refuge but to also interpret the great work of the world renowned naturalist Roger Tory Peterson. The York House which served as Dr. Peterson's office will offer visitors a glimpse of his work life. In addition, the habitats and wildlife that inhabit the land at the Peterson Unit will be the basis for many important stories to deliver to visitors from near and far.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Develop more detailed interpretive objectives and strategies as part of a Visitor Services Plan.
- Coordinate with state to provide resources and trainings to Friends, and volunteers in support of interpretive programs.
- Collaborate with the Friends group and volunteers to create meaningful, consistent, thematic statements to be used in the delivery of programming at the Peterson Unit.
- Work with Friends group and other partners to employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, print and social media, signs, and exhibits) when creating programming for natural and cultural resource interpretation.

*Within 10 years of CCP approval:*

- Develop self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.

*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through Friends group and other partners, annually provide quality interpretive programs, exhibits, and printed media at the Peterson Unit.
- Initiate a "refuge host" program, or utilize SCA interns and volunteers to provide personal contacts at the visitor contact station to initiate discussion and answer questions.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.

- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Although the Peterson Unit is unstaffed there may be opportunities to use the York House and a future trail for interpretation and events that honor his life and work.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Peterson Unit is unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

This objective is not applicable because the Roger Tory Peterson Unit is a 56-acre parcel in a rural portion of the town of Old Lyme. Hunting on this unit is not being proposed because it was not previously allowed, the adjacent landowners do not allow hunting, and it is in close proximity to houses.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

*This objective is not applicable because the Roger Tory Peterson Unit is a 56-acre parcel in a rural portion of the town of Old Lyme without suitable fishing opportunities. The Lieutenant River forms part of the eastern boundary; however, the riparian area is comprised of dense, tall vegetation that makes it virtually inaccessible from the refuge.*

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Roger Tory Peterson Unit.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this part of the state. Currently, there is no infrastructure in place at this unit to support this use, and consequently, visitation for wildlife viewing and photography is limited. Allowing people to engage in wildlife observation and photography is in keeping with the legacy of Roger Tory Peterson and the nature of the area.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Consistent with the final compatibility determination, allow public access at the unit daily from 30 minutes before sunrise to 30 minutes after sunset.
- Add information on the unit to the refuge website.

*Within 10 years of CCP approval:*

- Develop a public access strategy and required planning (e.g., additional NEPA, compatibility determinations) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the unit.

***Rationale:***
The entire unit would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance their time on the unit. Visitation increases are expected as this unit becomes better known and because of its connection to the Roger Tory Peterson legacy. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Add information on the unit to the refuge website.

*Within 5 years of CCP approval:*

- Produce a wildlife and plant species guide for the Roger Tory Peterson Unit that will be available on the refuge website, at the refuge headquarters.
- Install an informational kiosk in a conspicuous location to post information and notices to visitors.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Roger Tory Peterson Unit that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the unit without detrimentally impacting the wildlife resource.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow dispersed hiking and snowshoeing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with partners to determine whether a virtual geocache course at the unit is acceptable on the conserved property. The course should integrate orienteering with refuge interpretive messages that include linking this unit to other refuge divisions and units.

Maddie List/USFWS

*Holyoke Range from the Fort River Division, Massachusetts*

# State of Massachusetts

- **Dead Branch Conservation Focus Area (Existing Refuge Division)**
- **Fort River Conservation Focus Area (Existing Refuge Division)**
- **Mill River Conservation Focus Area (Existing Refuge Division)**
- **Westfield River Conservation Focus Area (Existing Refuge Division)**
- **Great Falls Discovery Center, Massachusetts (Existing Partner Facility)**
- **Honeypot Road Wetlands Unit (Existing Refuge Unit)**
- **Mount Toby Unit (Existing Refuge Unit)**
- **Mount Tom Unit (Existing Refuge Unit)**
- **Third Island Unit (Existing Refuge Unit)**
- **Wissatinnewag Unit (Existing Refuge Unit)**

# Overview
# Dead Branch Conservation Focus Area (Existing Refuge Division)

## Chesterfield, Westhampton, and Huntington, Massachusetts

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 6,012 | 85.9 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *97* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *5,915* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 988 | 14.1% |
| Total Acres in CFA[2, 4] | 7,000 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

The refuge's existing Dead Branch Division was established in 2011. The proposed Dead Branch CFA is part of an area identified by the State of Massachusetts as a priority for conservation. It would offer the opportunity to conserve and restore forested habitat and protect small dispersed wetlands. It would also help conserve lands along a high-quality segment of the Westfield River that supports a cold-water fisheries, such as eastern brook trout. The proposed CFA is located in an area with an extensive conserved lands network, including the Peru, Middlefield, and October Mountain State Parks, several TNC lands (e.g., Westfield River Highlands), Hinsdale Flats, Fox Den, Peru, and Walnut Hill Wildlife Management Areas, and other privately conserved lands. Additional land protection by the Service in this area will help better connect these conserved lands.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 88.4%
- Freshwater Marsh – 1.0%
- Shrub swamp and floodplain forest – 1.5%

For more information on habitats in the CFA, see map A.23 and table A.18.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.19 below, there are eight priority refuge resources of concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN), wetland dependent species and forest interior dwelling bird species. These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem. Migrants become more evenly distributed in watershed habitats beyond the Connecticut River main stem (Smith College 2006). The Dead Branch CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat for a diversity of bird species as well.

   The Dead Branch CFA is within the East Branch of the Westfield River Watershed which provides a contiguous core of mostly undeveloped forested acres. The Dead Branch CFA provides a diversity and mosaic of habitats including large patches of emergent and shrub wetlands. These habitats are important for breeding landbirds and waterbirds including those that are a priority for conservation. The priority refuge resources of concern for the Dead Branch CFA include blackburnian warbler, wood thrush, chestnut-sided warbler, Canada warbler, and American woodcock. This CFA is in the core range for these species, and many other species of conservation concern including black-throated blue warbler, black-throated green warbler, veery, purple finch and broad-winged hawk. The wetlands in the CFA support nesting and migrating American bittern, a state SGCN, and great blue heron.

2. **Waterfowl**
   The Dead Branch CFA wetland and riparian habitats provide potential breeding and foraging areas for American black duck, a PRRC species, as well as green-winged teal, common merganser, wood duck, and mallard.

3. **Diadromous fish and other aquatic species**
   The Dead Branch is an important cold-water tributary of the East Branch Westfield River. This tributary provides important cold water habitat for brook trout and Atlantic salmon. These species are PRRC, SGCN and a conservation concern for the Service's Northeast Region. Other cold aquatic species that occur within this watershed include slimy sculpin, lake chub, and many species of invertebrates, including the State rare riffle snaketail dragonfly.

4. **Wetlands**
   The Dead Branch CFA contains 187 acres of hardwood swamp, 113 acres shrub-swamp, and floodplain forest, and 75 acres of freshwater marsh. Many of these wetlands occur along slow-moving streams or small ponds, and are extensive beaver-controlled wetlands that support abundant odonates (dragonflies and damselflies), amphibians, waterfowl, and waterbirds. Habitat patches range from 2 acres to over 100 acres in size.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (ie. forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (stream, rivers, ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation. Map A. 22 below depicts the snowmobile trail that crosses the refuge.

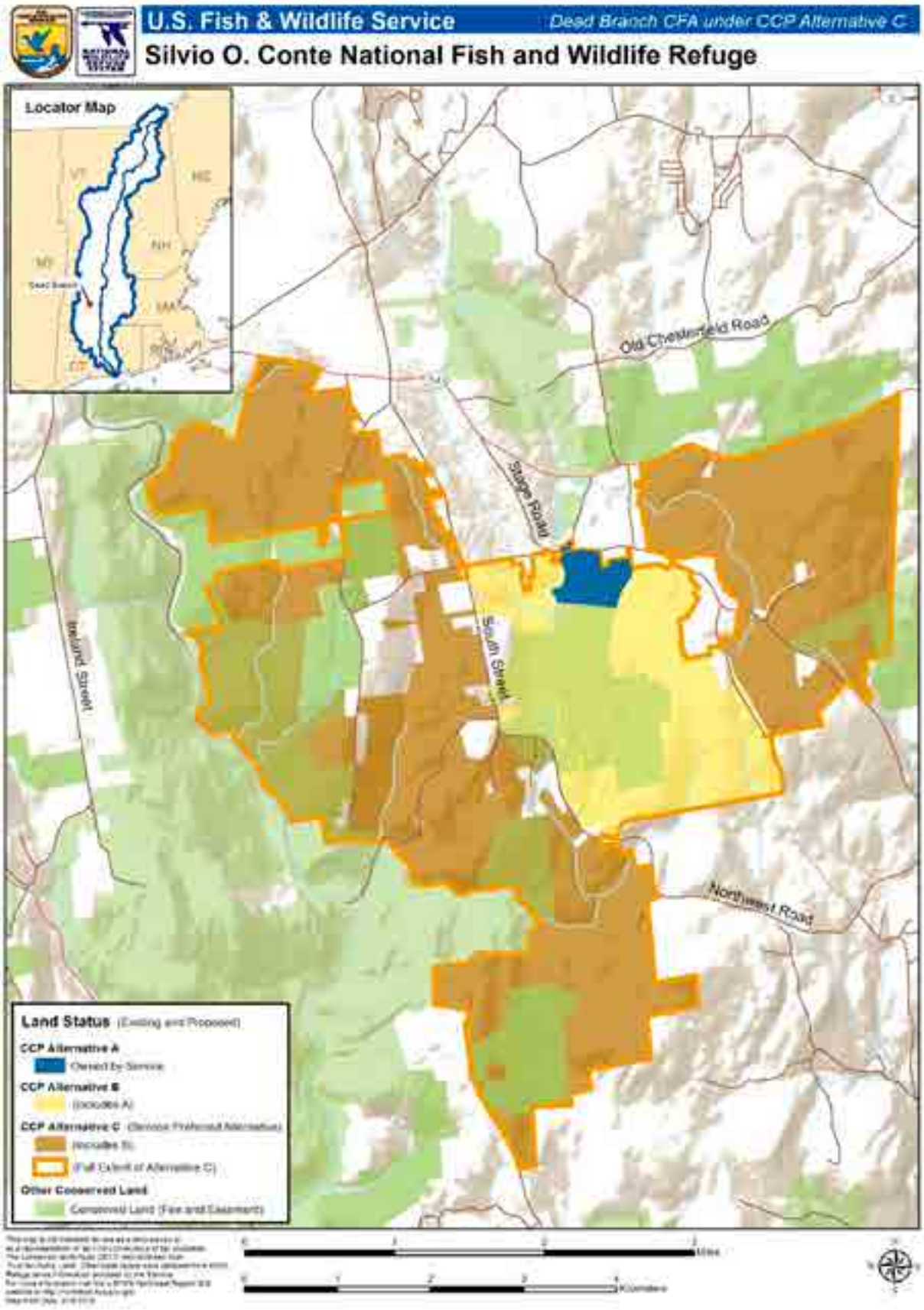
## Were there other special considerations in delineating the CFA boundary?

The Westfield River Watershed has been recognized by The Nature Conservancy, the State of Massachusetts and the National Wild and Scenic Rivers program as one of the most intact river systems in Massachusetts and one of the healthiest tributaries to the Connecticut River. The watershed is currently over 80% forested and only 4% developed, remarkable for southern New England.

The migratory fish runs of the Westfield River are a subject of ongoing research by Conte Anadromous Fish Research Laboratory, and the Westfield is used as a "quality river" reference for Target Fish Community analyses in other large river systems. Westfield State University uses the rivers and forests as an outdoor laboratory for study of physical and biological sciences and environmental education.

The East Branch of Westfield River/Westhampton area is striking in its beauty and offers access for recreation compatible with the protection of the significant natural resources it supports. Such uses include hiking, birding and wildlife observation, catch-and-release fly fishing between Chesterfield Gorge and the Knightville dam, whitewater and flatwater paddling, photography, snowshoeing, cross-country skiing, and environmental education.

*Map A.21. Dead Branch CFA – Location.*



*Map A.22. Snowmobiling at Dead Branch CFA.*

*Map A.23. Westfield River CPA – Habitat Types.*

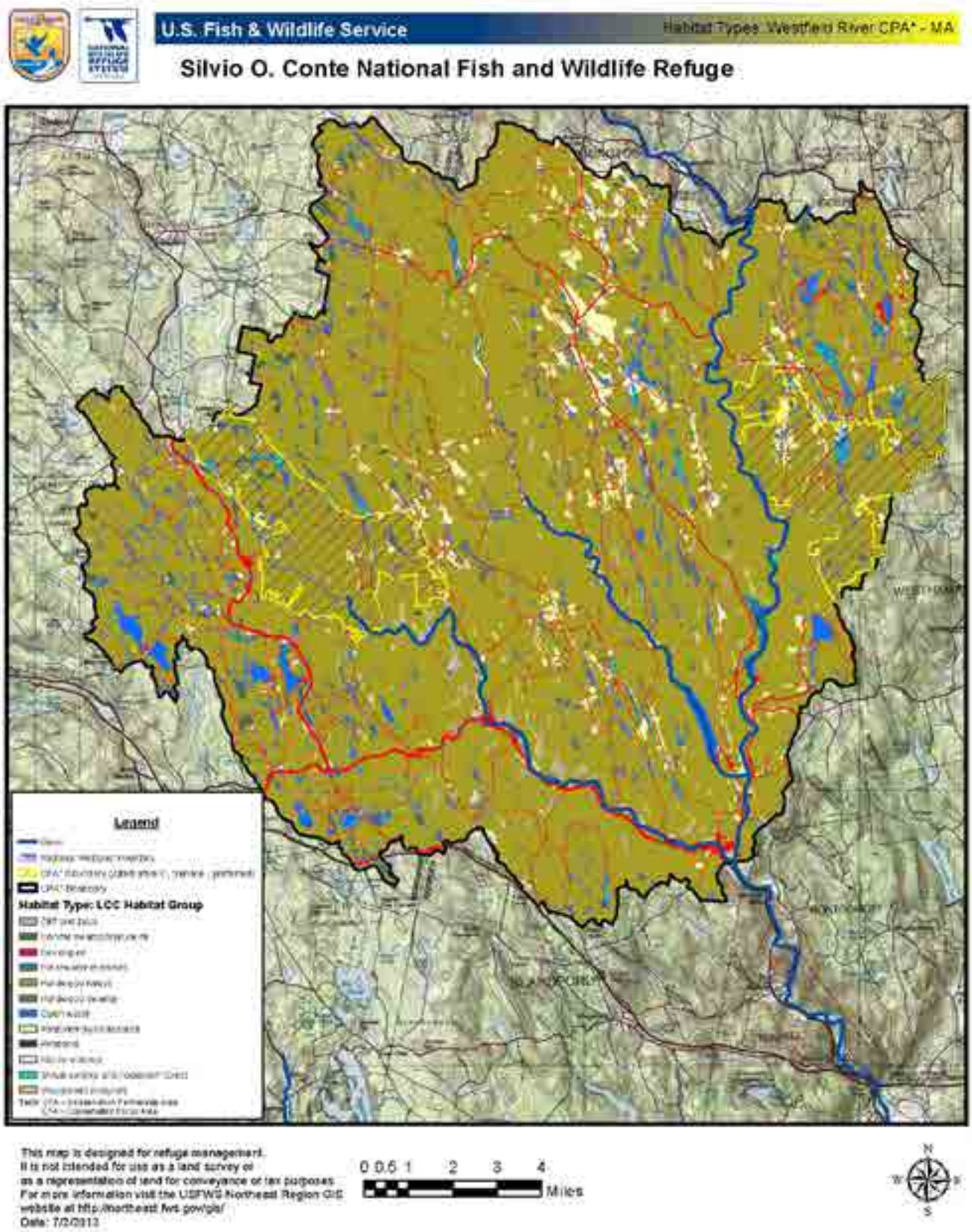


**Table A.18. Westfield River CPA/Dead Branch CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 1,712 | 1.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| Hardwood forest | 127,161 | 85.3% | 6,773 | 1,034 | 73 | 88.4% | 5.3% |
| Hardwood swamp | 2,447 | 1.6% | 187 | 26 | 0 | 2.4% | 7.6% |
| Shrub swamp and floodplain forest | 1,018 | 0.7% | 113 | 34 | 0 | 1.5% | 11.1% |
| Woodlands (natural) | 563 | 0.4% | 5 | 5 | 0 | 0.1% | 0.8% |
| *Forested uplands and wetlands subtotal* | *132,901* | *89.1%* | *7,077* | *1,098* | *73* | *92.4%* | *5.3%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 775 | 0.5% | 5 | 3 | 0 | 0.1% | 0.6% |
| Freshwater marshes | 676 | 0.5% | 75 | 7 | 1 | 1.0% | 11.1% |
| Pasture/hay/grassland | 6,215 | 4.2% | 337 | 91 | 5 | 4.4% | 5.4% |
| Peatland | 4 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky outcrop | 254 | 0.2% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *7,924* | *5.3%* | *417* | *102* | *5* | *5.4%* | *5.3%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1,547 | 1.0% | 14 | 4 | 0 | 0.2% | 0.9% |
| *Inland aquatic habitats subtotal* | *1,547* | *1.0%* | *14* | *4* | *0* | *0.2%* | *0.9%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Other** | | | | | | | |
| Developed | 6,738 | 4.5% | 150 | 12 | 1 | 2.0% | 2.2% |
| *Other subtotal* | *6,738* | *4.5%* | *150* | *12* | *1* | *2.0%* | *2.2%* |
| **TOTAL** | **149,110** | **100.0%** | **7,658** | **1,216** | **79** | **100.0%** | **5.1%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.19. Westfield River CPA/Dead Branch CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 6,773 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Black-billed Cuckoo[A,J]<br>Broad-winged hawk[I,J]<br>Purple Finch[A]<br>Northern Flicker[A, J]<br>Ruffed Grouse[A, I]<br>Whip-poor-will[A, I, J]<br>Black-throated Blue Warbler[A]<br>Black-throated Blue Warbler[A] **Louisiana Waterthrush[I]**<br>Brown Thrasher[I]<br>**Ovenbird[A]**<br>**Eastern Red Bat[I]**<br>American Redstart[A, J]<br>Veery[A]<br>Sharp-shinned Hawk[I,J]<br>Yellow-bellied Sapsucker[A,J]<br>Black Racer[I]<br>Bobcat[I]<br>Jefferson Salamander[I,J]<br>Moose[I]<br>Black Bear[I]<br>Rose-breasted Grosbeak[A] |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |
| **Chestnut-sided Warbler[A, B, I]** | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Hardwood Swamp[5] - 187 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | **Northern Waterthrush**<br>Red-shouldered Hawk[J]<br>Rose-breasted Grosbeak[J]<br>Veery[A,J]<br>White-eyed Vireo[J]<br>Northern Parula[A,I]<br>Wood Duck[J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 113 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands, and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | Chestnut-sided Warbler[A]<br>Ruffed Grouse[A, I]<br>Eastern Ribbon Snake[I]<br>**Warbling Vireo**<br>**Spotted Turtle[I]**<br>American Redstart[A, J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>Eastern Towhee[I]<br>White-throated Sparrow[I]<br>**Willow Flycatcher[I]**<br>Black Racer[I]<br>Wood Duck[J]<br>**Wood Turtle[I]** |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Woodlands (natural)[5] - 5 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] - 5 acres** | | |
| North-central Appalachian acidic cliff and talus[H]<br><br>North-central Appalachian circumneutral cliff and talus[H] | The *North Central Appalachian acidic cliff and talus system* comprises sparsely vegetated to partially wooded cliffs. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be comparatively well-developed and different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. Eastern red cedar is a characteristic tree species, poison ivy a characteristic woody vine, and common polypody a characteristic fern. Substrates within the *circumneutral cliff and talus system* include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood, and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern. (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Freshwater Marshes[5] - 75 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **Marsh Wren**<br>**American Bittern[A,I]**<br>Northern Harrier[A,I,J]<br>Spotted Turtle[I]<br>Bridle Shiner[I]<br>Northern Leopard Frog[I]<br>Spatterdock Darner[I]<br>New England Bluet[I]<br>Wood Turtle[I]<br>Canada Goose[A,J]<br>Wood Duck[J] |
| **Pasture/Hay/Grassland[5] – 337 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[I,J]<br>Northern Harrier[A,I,J]<br>**Bobolink[A,I]**<br>**Eastern Meadowlark[I]**<br>**Grasshopper Sparrow[I]**<br>Black Racer[I]<br>White-throated Sparrow[I] American Kestrel[I]<br>Northern Leopard Frog[I]<br>Willow Flycatcher[I]<br>Prairie Warbler[I] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] – 14 acres** | | |
| **Brook Trout**[B, F] | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Longnose Sucker[I]<br>Bridle Shiner[I]<br>**Slimy Sculpin**[I]<br>Creek Chubsucker[I]<br>Longnose Dace[I]<br>Riffle Snaketail[I]<br>**Spring Salamander**[I]<br>Lake Chub[I]<br>Wood Turtle[I] |
| **Atlantic Salmon**[B, F, G] | Spawn in cold freshwater moving streams w/coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2005 Massachusetts Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Dead Branch CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, American woodcock, chestnut-sided warbler, Canada warbler, and blackburnian warbler.

***Rationale:***
We envision healthy forests within the Dead Branch CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Massachusetts wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Dead Branch CFA hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is certainly available within the CFA. To date, our review of the Dead Branch CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Dead Branch comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Dead Branch are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Dead Branch will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like refuge priority species of concern American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of

conservation concern like chestnut-sided warbler, ruffed grouse, eastern red bat, and—if wetlands and riparian areas are present—Canada warbler (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Dead Branch's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0 to 5 feet in height) are of particular importance to species like Canada warbler. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who dwell in the upper canopies of conifers, and are thought to be strongly associated with the hemlock forests within Dead Branch. Blackburnian warblers have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—where softwood inclusions are abundant—blackburnian warbler. Our efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, see also Rawinski 2008).

Management to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy— provide special habitats that are utilized by species like the northern goshawk. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure and/or composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Identify forest stands where soils and species composition will support woodcock management.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible. In particular:
  - ✓ Conduct a thorough inventory of invasive plants.
  - ✓ Prevent garlic mustard from spreading and evaluate the threat of multiflora rose to important habitats.
  - ✓ Collaborate with partners within the Westfield River Watershed Invasive Species Partnership (WISP) to strategically prevent and manage invasive species within the watershed, including on refuge land.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Hardwood swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for priority refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Dead Branch CFA, hardwood swamps have undergone significant alteration and have great potential for restoration. This habitat type is often in basins, or on gently sloping seepage lowlands. Examples of this forest type may be found in small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the watertable and the nutrient-poor soils drive complexes of forest upland and wetland species including eastern hemlock, red maple, and black gum. Within the Connecticut River watershed, including the CFA, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions and soil compaction remain as threats.

Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within the Dead Branch will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Many species of conservation concern use forested swamps, including northern parula, willow flycatcher, white-eyed vireo, and rose-breasted grosbeak. Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well-developed shrub layer—an important habitat component for foraging

and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Hardwood swamps in the Dead Branch CFA are within a matrix of contiguous forest, where fragmentation is not currently a concern. Hardwood swamp patches of 10 acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Dead Branch CFA, and allow monitoring of population response to management actions (Dettmers personal communication 2013).

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites. Hardwood swamp stands with relatively large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat

conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of a woodcock management area. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season, and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests in the vicinity of foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife utilization of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Sub-objective 1.1d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can

be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Dead Branch CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily and narrow-leaved cattail (Gawler 2008). Our coarse-scale habitat analysis of this CFA identifies freshwater marsh habitat as part of a larger wetland complex along the Dead Branch and within Dead Swamp.

This particular wetland complex is adjacent to a slow moving stream, and open water, providing foraging, and potentially breeding habitat for American black duck, and other waterfowl species. Black ducks use wetlands such as these for breeding and foraging habitat. Well-concealed nests are placed on the ground in adjacent uplands or hummocks within the wetland. Adults and their broods feed on seeds and herbaceous vegetation, including sedges, rushes, and submerged aquatic vegetation, as well as invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for American black duck.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate wetland hydrology for impacts to natural flow regimes.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Inventory wetland plant communities.
- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Over four percent of the Dead Branch CFA is pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing “old field” habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches, or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
See the rationale for sub-objective 1.1d.

Habitats that occur within the Dead Branch CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered

under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and Atlantic salmon.

***Rationale:***
The Dead Branch CFA is located in the Westfield River watershed, which has been recognized by The Nature Conservancy, the State of Massachusetts and the National Wild and Scenic Rivers program as one of the most intact river systems in Massachusetts and one of the healthiest tributaries to the Connecticut River. The Dead Branch is an important cold-water tributary of the East Branch Westfield River, and the conservation of its watershed is the focus of the Dead Branch CFA. The Dead Branch provides important cold water habitat for brook trout and Atlantic salmon. These species are sensitive to extreme temperature fluctuations, and require water temperatures between 40-70 degrees Fahrenheit for spawning, growth, and survival. Other cold aquatic species that occur within this watershed include slimy sculpin, lake chub, and many species of invertebrates, including the rare riffle snaketail dragonfly. Wood turtle, a state species of greatest conservation need also occurs in this CFA.

We will work with partners to provide aquatic habitat with clear aquatic species passage to spawning and wintering habitat and structurally diverse in-stream habitat. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent on not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of the water resources in the CFA will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.
- Conduct stream assessments to identify man-made physical barriers (e.g., impassable road crossings, culverts, and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Dead Branch Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Dead Branch Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Dead Branch Division as an outdoor classroom.

*Rationale:*
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Dead Branch Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Dead Branch Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale*:**
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Dead Branch Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Dead Branch Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Dead Branch Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See the rationale for sub-objective 2.2a.

**Management** Strategies:
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and a Friends group, annually provide quality interpretive programs, exhibits, printed media at the Dead Branch Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures (e.g., general brochure and bird checklist) that incorporate refuge interpretive messages and themes.

- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Dead Branch Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Becuase the Dead Branch Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations and division-specific regulations, if necessary.

***Rationale:***
Hunting is priority public use on national wildlife refuges and a popular outdoor recreational activity. The Dead Branch Division has been a popular area with hunters for many years prior to acquisition by the Service. All of the division is currently open to hunting under an interim pre-acquisition compatibility determination, excluding safety zones around buildings. Retaining hunting opportunities at this division conforms to historic use on this property and much of the surrounding land in the area. Popular game species include white-tailed deer, black bear, ruffed grouse, and cottontail rabbits. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
*Continue to:*

- Allow hunter access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are discernable.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to determine whether opportunities exist for state-recognized disable hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Dead Branch Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Offer to host hunter education field courses.
- Work with Massachusetts Department of Fish and Game to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Dead Branch Division after completing all administrative procedures to officially open refuge lands to fishing, based on Massachusetts Department of Fish and Game regulations, and division-specific conditions, if necessary.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The division has been open to fishing, following acquisitions, through pre-acquisition compatibility determinations, but no formal opening package or fishing plan has been completed. The Dead Branch and other tributaries of the Westfield River are popular with anglers.

**Management Strategies:**
*Continue to:*

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Dead Branch Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of CCP approval:*

- Work with the Massachusetts Department of Fish and Game to inventory and assess fish populations on the division.
- Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
This division currently includes a reach of the Dead Branch River that supports populations of brook trout. Anglers will benefit from division-specific information on this fishery.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Dead Branch Division.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in western Massachusetts. Currently, there is no infrastructure in place at the division to support this use, and consequently, visitation for wildlife viewing and photography is limited and dispersed.

**Management Strategies:**
*Continue to:*

- Allow public access at the Dead Branch Division daily from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers, consistent with the final compatibility determination.

*Within 5 years of CCP approval:*

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 10 years of CCP approval:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the division.

***Rationale:***
The entire division is available for wildlife observation and photography; however, there are steps the refuge can take to enhance their time on the division. Visitation increases are expected as this division expands and becomes better known. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups to offer wildlife-related trips to the division.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Dead Branch Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that are part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Dead Branch Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Dead Branch Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division. Each of these must be found to be both appropriate and compatible to be an authorized use of the refuge.

**Management Strategies:**
*Continue to:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

*Within 1 year of CCP approval:*

- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.
- Allow snowmobiling on existing snowmobile trails (e.g., trails depicted on the Snowmobile Association of Massachusetts trail map) that are groomed by an established snowmobile organization and is compatible and consistent with applicable Service laws, policy and guidelines. The responsible snowmobile club will maintain trails under a special use permit. Designated snowmobile trails on refuge land are available in accordance with Massachusetts Department of Conservation and Recreation regulations and, where applicable, MassWildlife snowmobile guidelines.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Fort River Conservation Focus Area (Existing Refuge Division)

## Hadley and Amherst, Massachusetts

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 1,662 | 73.0 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *261* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *1,401* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 615 | 27.0% |
| Total Acres in CFA[2, 4] | 2,277 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

The Fort River area was an SFA in the 1995 Conte FEIS and the refuge's Fort River Division was established in 2005. The proposed Fort River CFA presents two major opportunities. The first is to restore grassland and early successional habitat (shrubland habitat) to benefit declining species, such as bobolinks and other grassland-nesting species. The second opportunity is to protect floodplain forest along the Fort River and create a connection between these forests and adjacent conserved upland habitat within the Holyoke Range.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Pasture/Hay/Grassland – 60.4%
- Hardwood Swamp – 3.4%
- Shrub Swamp and Floodplain Forest – 2.3%

See map A.26 and table A.20 for more detailed habitat information for the CFA.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.21 below, there are two priority refuge resources of concern (PRRC) aquatic species that rely upon the open water habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. This includes potential for a large tract of contiguous grasslands to benefit declining grassland dependent species, and floodplain, a habitat that has undergone significant alteration within the Connecticut River watershed. The refuge will seek to protect and restore (if necessary) these, and other PRRC habitat types. Additionally, we recognize the value of this area to State species of greatest conservation need (SGCN) and migratory landbirds. These species and habitats are discussed further below.

1. **Federal Threatened and Endangered Species**
   American eel spend the majority of their young life in freshwater systems. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit bays, estuaries, streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Fort River CFA is situated on the Connecticut River, and can provide significant stopover habitat for migrants in the spring and fall.

   Over 60 percent of the Fort River CFA is in pasture, hay, grassland, and habitat consisting mostly of large fields between 200 and 400 acres. Management of these fields as grassland habitat would benefit declining grassland bird species. Grasslands are a high priority habitat for the State of Massachusetts. These habitats provide breeding and nesting habitat for several State threatened and endangered species, including northern harrier, upland sandpiper, barn owl, and grasshopper sparrow. Upland sandpipers historically nested in the Fort River CFA, and can be seen on occasion during migration. Many grassland birds are area sensitive, and require large grassland acres (greater than 25 acres) including grasshopper sparrows, bobolinks, eastern meadowlarks, and upland sandpiper (Vickery et al. 1994). A contiguous block of grassland habitat in the Fort River Division will benefit these species, and provide a habitat that is increasingly rare in the region.

3. **Diadromous fish and other aquatic species**
   The PRRC species for the Fort River CFA includes American eel, a species petitioned in 2010 for listing under the Endangered Species Act. The lower reaches of the Fort River meander through the Fort River CFA, where these species occur. The Fort River is the longest free-flowing tributary to the Connecticut River in Massachusetts, and ranks near the top among all New England rivers for overall freshwater mussel diversity. The federally endangered dwarf wedgemussel occurs in a portion of the river between Plum and Hop Brooks, about a mile from the CFA boundary. This listed species has not been documented in the CFA, and will be added as PRRC species if it is documented in the CFA in the future.

4. **Wetlands**
   Seventy-eight acres of hardwood swamp, 53 acres of shrub swamp and floodplain forest, and 19 acres of freshwater marshes add to the diversity in the landscape. The majority of these wetland acres are within the floodplain of the Fort River. According to The Nature Conservancy, the floodplain forests along the Fort River main stem contain high species richness, and have undergone significant alternation (Marks et al 2011). The floodplain habitat within the CFA has great potential for restoration . Intact floodplain forests in the Fort River CFA will provide high-quality habitat for neo-tropical migratory birds, restore forest connectivity and travel corridors for wildlife, and increase water quality and shade for aquatic species.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

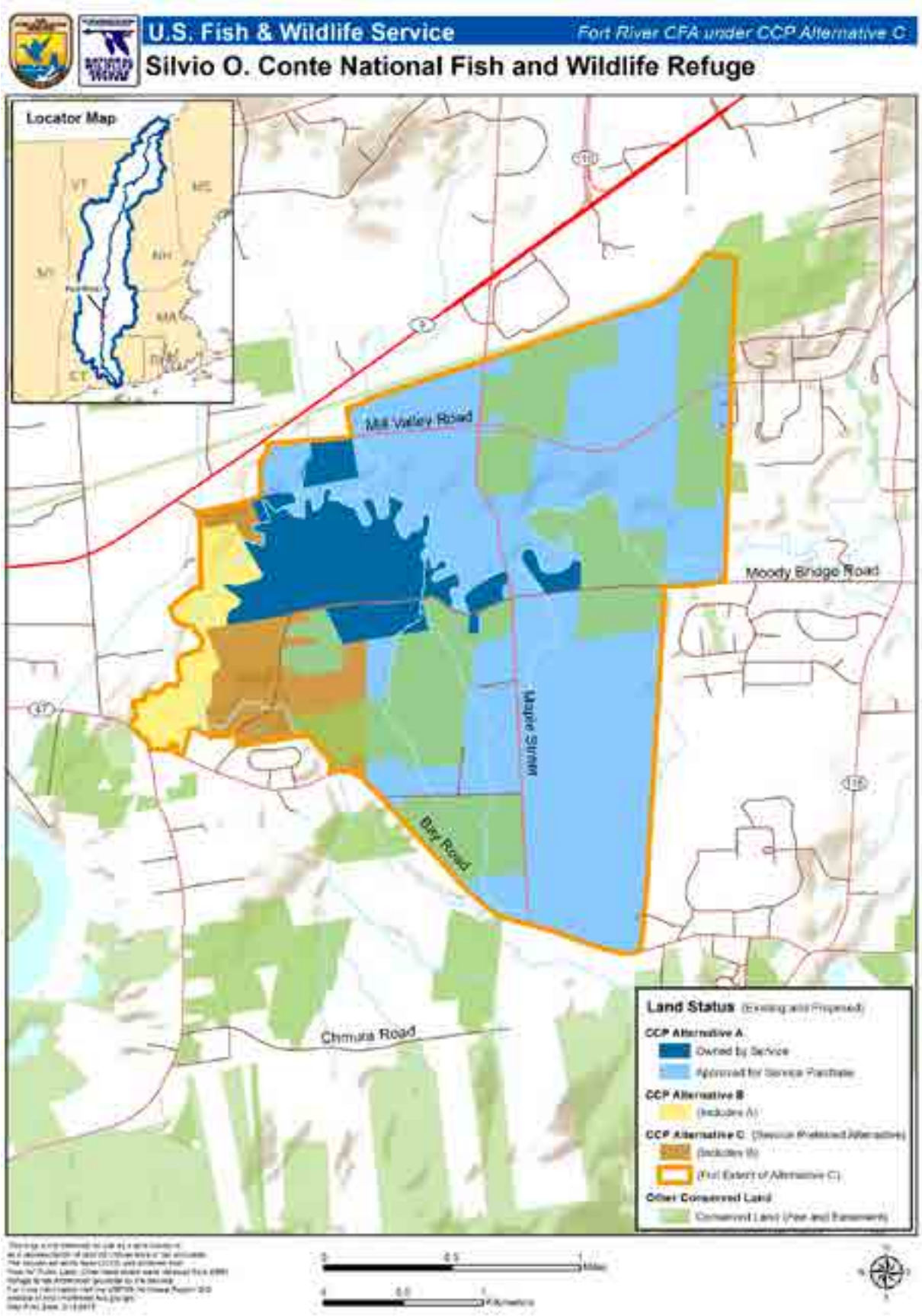
We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested, and open water habitats) will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will focus on restoration of degraded floodplains, including where appropriate, restoring the primary natural disturbance mechanism (seasonal flooding) and species composition and structure to accepted historical conditions. Management of upland forests will improve structural diversity and species composition will be appropriate for site conditions and location.
- Where appropriate, and feasible, we will maintain large, contiguous acres of warm season grasses.
- Our management activities in emergent and shrub wetland habitats will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers) habitats, we will focus on maintaining stream connectivity, establishing riparian buffers, and reducing run-off from the surrounding landscape.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

Our priority would be to continue offering the six, priority public uses: wildlife observation and photography, environmental education, interpretation, fishing (not officially open), and hunting. We recently completed ADA-accessible trail on the division (map A.25).

*Map A.24. Fort River CFA – Location.*



*Map A.25. Fort River CFA – Fort River Trail.*

*Map A.26. Fort River CFA/CPA – Habitat Types.*

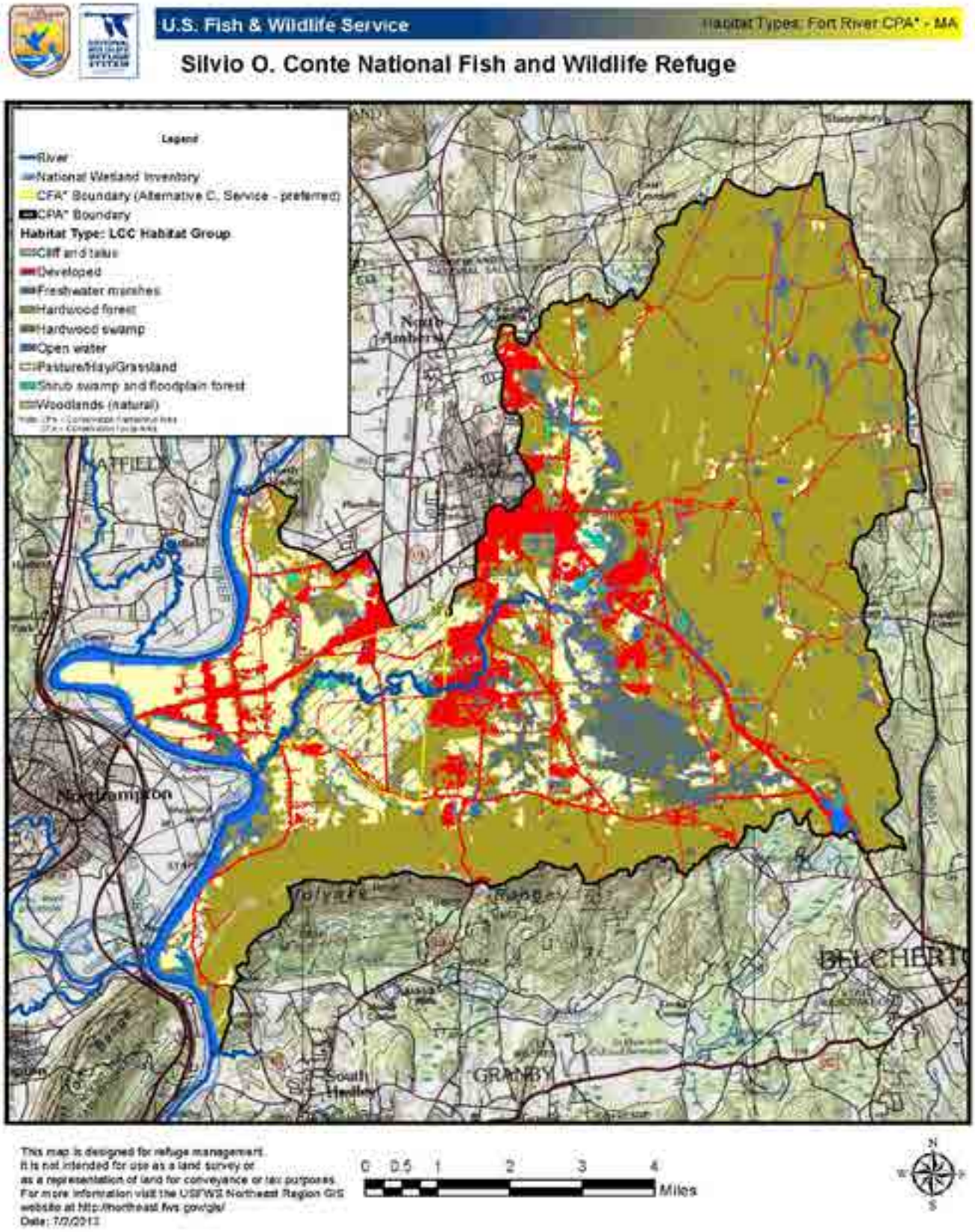


**Table A.20. Fort River CFA/CPA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Hardwood forest | 25,156 | 59.7% | 509 | 82 | 52 | 22.4% | 2.0% |
| Hardwood swamp | 3,092 | 7.3% | 78 | 26 | 11 | 3.4% | 2.5% |
| Shrub swamp and floodplain forest | 184 | 0.4% | 53 | 15 | 26 | 2.3% | 28.9% |
| Woodlands (natural) | 114 | 0.3% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Forested uplands and wetlands subtotal* | *28,545* | *67.7%* | *640* | *123* | *89* | *28.2%* | *2.2%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 77 | 0.2% | 0 | 0 | 0 | 0.0% | 0.0% |
| Freshwater marshes | 85 | 0.2% | 19 | 0 | 0 | 0.8% | 22.3% |
| Pasture/hay/grassland | 6,963 | 16.5% | 1,373 | 447 | 114 | 60.4% | 19.7% |
| *Non-forested uplands and wetlands subtotal* | *7,125* | *16.9%* | *1,392* | *447* | *114* | *61.2%* | *19.5%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1,067 | 2.5% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Inland aquatic habitats subtotal* | *1,067* | *2.5%* | *0* | 0 | *0* | *0.0%* | *0.0%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Other** | | | | | | | |
| Developed | 5,399 | 12.8% | 241 | 44 | 10 | 10.6% | 4.5% |
| *Other subtotal* | *5,399* | *12.8%* | *241* | *44* | *10* | *10.6%* | *4.5%* |
| **TOTAL** | **42,137** | **100.0%** | **2,273** | **613** | **213** | **100.0%** | **5.4%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.21. Fort River CFA – Preliminary Priority Refuge Resources of Concern**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 509 acres** | | |
| Appalachian (hemlock)-northern hardwood forest[H] | Northern hardwoods such as sugar maple, yellow birch, and American beech are characteristic of the *Appalachian (hemlock)-northern hardwood forest*, either forming a deciduous canopy or mixed with eastern hemlock. Other common and sometimes dominant trees include Oak (most commonly red oak), tulip poplar, black cherry, and black birch (Gawler 2008). | Migratory species |
| **Hardwood Swamp[5] - 78 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-central interior wet flatwoods[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. Eastern hemlock is usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-central interior wet flatwoods* usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, akeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. Pin oak typically dominates and is often associated with swamp white oak and Red maple. American sweetgum and black tupelo are also common associates. Understory herbaceous and shrub species present in examples of this system can vary. Some common species include sedges, cinnamon fern, common buttonbush, alder, and holly (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 53 acres** | | |
| Laurentian-Acadian wet meadow-shrub swamp[H] | *Wet meadow-shrub-swamps* are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and grass dominance; typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Trees are generally absent and, if present, are scattered (Gawler 2008). | Migratory species |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 19 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Migratory species |
| **Pasture/Hay/Grassland[5] – 1,373 acres** | | |
| Where appropriate, maintain as contiguous block of grassland habitat | Grasslands include fields managed for warm season grasses, such as switch grass, Indian grass, and blue stem, hayfields/pastures that are intensively managed for cool season grasses and active pastures. | American Woodcock[A, I, J]<br>**Bobolink[A,I]**<br>**Upland Sandpiper[A, I]**<br>Northern Harrier[I, J]<br>**Grasshopper Sparrow[I]**<br>**Eastern Meadowlark[I]**<br>Wood Turtle[I, J]<br>Field Sparrow[A,I]<br>American Kestrel[I]<br>Eastern Kingbird[A] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] –** *GIS data did not capture acreage due to dense forest cover along small stream and river corridors* | | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Sea Lamprey[I]<br>Longnose Dace[I]<br>Fallfishl[I]<br>Harpoon Clubtail[I]<br>Arrow Clubtail[I]<br>Rapids Clubtail[I]<br>**Spring Salamander[I]**<br>Wood Turtle[I] |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.
B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.
C: 2008 USFWS Birds of Conservation Concern.
D: Federal Threatened and Endangered status as of 2010, including Candidate Species
E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010
F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan
G: Silvio O Conte Refuge Purpose Species.
H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.
I: 2005 Massachusetts Comprehensive Wildlife Conservation Strategy
J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

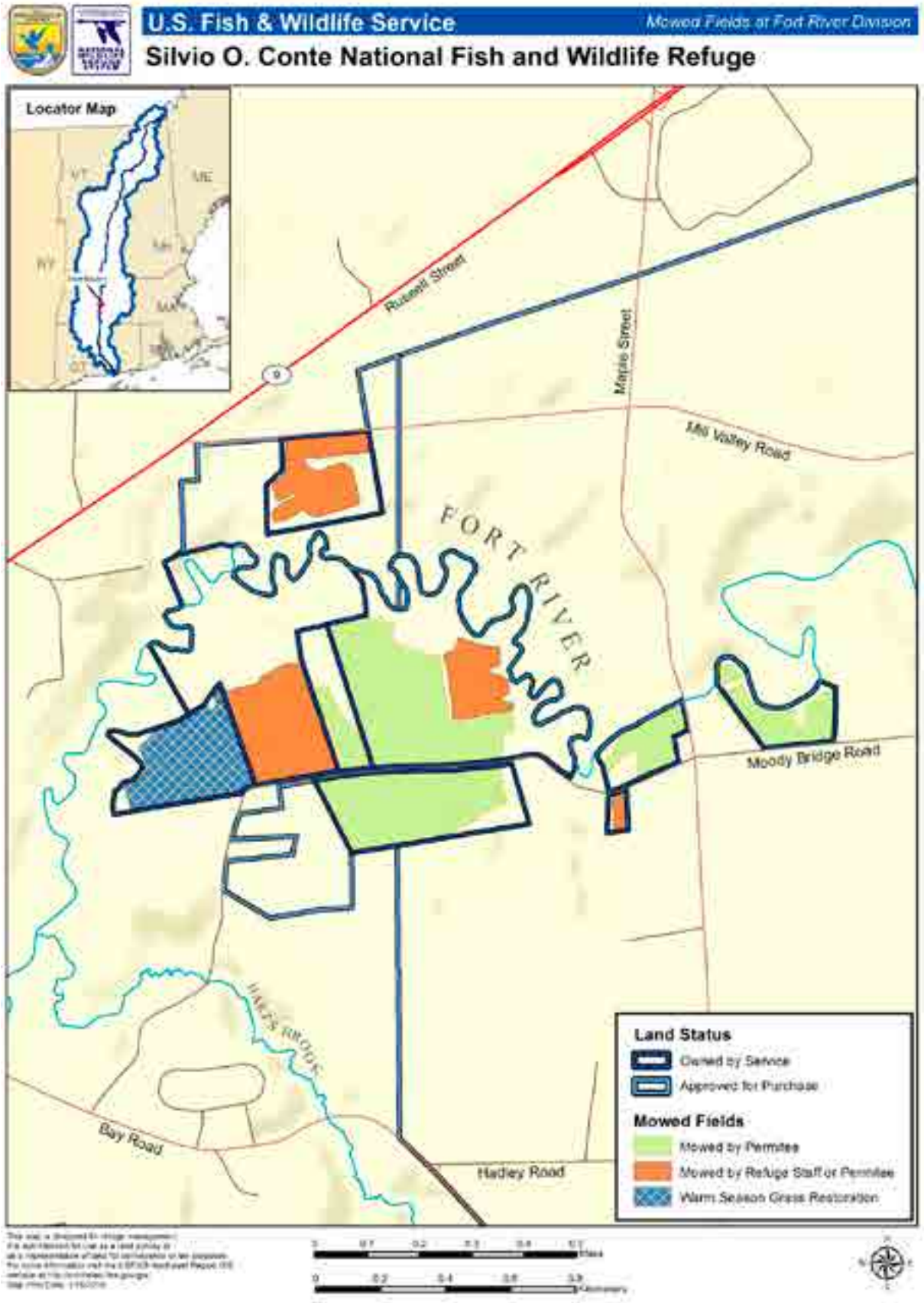
4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

*Map A.27. Fort River CFA – Fields Mowed and Hayed.*



# Goals, Objectives, and Strategies for Refuge Lands in the Fort River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
We envision healthy forests within the Fort River CFA where a diverse seral structure provides suitable habitat conditions for a suite of Massachusetts wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Fort River CFA hardwood forests provide a diversity of habitats for wildlife. To date our review of the Fort River CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to use characteristics common to these habitats. Our understanding of the forest structure within Fort River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Fort River are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and where appropriate, move succession forward to emulate later seral stage characteristics.Migrating landbirds are typically unable to deposit sufficient fat stores to fly nonstop between breeding and nonbreeding areas (Blem 1980) and must use stopover habitats for feeding and resting before continuing migration. Studies have shown migrating birds exhibit selective use of some habitats over others (Moore et al. 1990, Petit 2000, Rodewald et al. 2004). In general, taller, more structurally diverse vegetation types within an area appear to support greater numbers of migrating birds than do habitats of lower stature and complexity (Moore et al. 1990, Noss 1991). Clearly, structurally complex habitats will not be suitable for all migratory species, but our conservation goal is to provide those habitat characteristics used most frequently by migrating birds, suggesting relatively tall, structurally diverse habitats may best serve this purpose. The plasticity in habitat use exhibited by most species during migration (Moore et al. 1990, Petit 2000) suggests that many species are able to effectively use the food resources and cover afforded by structurally complex habitats. While our management goals may create a relatively old forest, hardwood forests within Fort River will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of foraging opportunities. Patches of mature edge-dominated (i.e., forest-agricultural edge and suburban forest of the type within Fort River) and shrub-sapling stage forests were used most frequently by fall stopover migrants in a Pennsylvania study (Rodewald et al. 2004).

In a mature forest, many migrating bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Fort River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of foraging opportunities. Our active forest management efforts will aim to create or maintain a canopy that is generally closed (>75-80% closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral shrub-sapling habitat rich in fruits and insects important to migrating birds (Noss 1991, DeGraaf et al. 2006). Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, see also Rawinski 2008).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function.
- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complements adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices.
- Protect hard and soft mast producing species such as American beech inclusions, oak and hickory species, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible. Management priorities include oriental bittersweet, glossy buckthorn, garlic mustard, and multi-flora rose.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Hardwood swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide stopover habitat for spring and fall migrant birds.

***Rationale:***
Occurrences of hardwood swamps within the Fort River Conservation Focus Area (CFA) have undergone significant alteration and have great potential for restoration. This habitat type is often found in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow,

perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the watertable drives complexes of forest upland and wetland species including pin oak, red maple, sweetgum, and black gum. The examples identified within the Fort River CFA are limited and largely occur within the floodplain of the Fort River. Agricultural practices, development pressures, and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in hardwood swamps are not well understood. One possibility in the north-central Appalachian acidic swamps is that these areas once had a higher proportion of softwoods such as hemlock. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within the Fort River will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Where appropriate, restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for spring and fall migrant birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites shown to be important during the energy-intensive migration (Petit 2000).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan (HMP).

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Massachusetts in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition.

*Within 10 years of CCP approval:*

- Implement identified forest management opportunities to improve species composition.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Restore native species composition and structure, and improve the natural hydrology, as needed, to support natural and rare shrub swamp and floodplain forest ecological communities. Management will provide stopover habitat for spring and fall migrant birds.

***Rationale:***
The shrub swamps in the Fort River CFA are restricted to poorly drained areas and small seepage zones along the Fort River and within the hardwood swamp communities in the CFA. These shrub swamp systems usually have a patchwork of shrub and grass dominance, and may include willow, silky dogwood, speckled alder, white

meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). Based on our coarse-scale habitat analysis, the shrub swamps are also adjacent to agricultural land, and impacts to the wetland hydrology may be factor. Water pollution and invasive species introductions are also threats for shrub swamp communities.

Restoration of shrub swamp communities, as well as the surrounding forested habitat, will create high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Fort River CFA is situated on the Connecticut River, and can provide significant stopover habitat for migrants in the spring and fall. Neo-tropical migrants typically use similar habitats during migration as they do during the breeding season (Petit 2000). Species such as gray catbird, yellow-rumped warbler, white-eyed vireo, eastern phoebe, eastern kingbird and common yellowthroat will use shrubland communities (McCann et al. 1993). Native shrubs will provide migrants with soft mast and abundant insects to replenish fat reserves, and structure to provide rest and adequate cover from predators and inclement weather.

We have conducted an invasive plant inventory at the Fort River Division, and there are substantial invasive plant infestations. Invasive multiflora rose is a predominant shrub in both riparian floodplain forests and grassland fields and some control of this species has been undertaken by the Youth Conservation Corps. Volunteers have helped control efforts for garlic mustard, which is beginning to spread in the floodplain forests, adjacent wetlands and forest edge. Oriental bittersweet threatens the health of floodplain trees. Other invasive species present include Japanese barberry, purple loosestrife, glossy buckthorn, reed canary grass, autumn olive, and black locust, among others.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Continue to:*

- Control known invasive plant infestations such as oriental bittersweet, multiflora rose, and garlic mustard.
- Work with TNC to plant American elms on the Fort River Division as part of floodplain restoration.

*Within 5 years of CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Coordinate with the Massachusetts Natural Heritage and Endangered Species Program and town Conservation Commission to ensure invasive plant management complies with the Massachusetts Endangered Species Act and the Massachusetts Wetland Protection Act.
- During the development of the Habitat Management and Integrated Pest Management Plans, assess the threats to native plants from invasive plants and develop priority invasive plant management strategies to limit these threats.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marshes)**
Restore native species composition and structure, and improve the natural hydrology, as needed, to support natural and rare ecological freshwater marsh communities. Management will provide stopover habitat for spring and fall migrant birds.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily and narrow-leaved cattail (Gawler 2008). Based on our coarse-scale habitat analysis, freshwater marsh communities occur in swales within the agricultural fields of the Fort River CFA. Water pollution, altered hydrology, and invasive species introductions are threats for freshwater marsh communities.

Restoration of freshwater marsh communities, as well as the surrounding forested habitat, will provide a diversity of habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Fort River CFA is situated on the Connecticut River, and can provide significant stopover habitat for migrants in the spring and fall. Neo-tropical migrants typically use similar habitats during migration as they do during the breeding season (Petit 2000). These freshwater marshes are not large, and may not provide adequate stopover habitat for species such as rails, bitterns, and egrets, but add to the diversity in the landscape and foraging opportunities for species using adjacent habitats.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Where appropriate, maintain a contiguous block of grassland habitat for breeding and migrating grassland bird species; areas not managed for grassland birds will be allowed to revert to natural conditions.

***Rationale:***
Over 60 percent of the Fort River CFA is typed as pasture, hay and grassland, consisting mostly of large fields between 200 and 400 acres. Management of these fields as grassland habitat would benefit declining grassland bird species, and provide a habitat that is increasingly rare in the region.

Native grasslands were once more widespread in North America. A deterioration of rangelands, the conversion of prairies to agriculture, and afforestation of the eastern United States are significant factors to the decline of grassland bird populations. During European settlement, millions of acres of forests

were cleared for agriculture in the eastern U.S., creating habitat for grassland dependent birds. As agricultural activities declined, open areas dominated by herbaceous vegetation began to convert back to forests, causing a drastic decline in grassland species in the region (Brennan and Kuvlesky Jr 2005).

In fact, several grassland species are listed as threatened or endangered by the state of Massachusetts, including northern harrier, upland sandpiper, barn owl, and grasshopper sparrow. Grasslands are a high priority habitat for the state, and maintaining large, contiguous acres of warm season grasses at the Fort River CFA would benefit these species.

We also support the protection of high-value, productive agricultural lands identified by local communities and the State. It is not the refuge's intention to target these lands for acquisition. Instead, our priority would be to work with individual landowners, states, and other Federal agencies to protect these lands and ensure they continue to be part of the working landscape. There are many State and Federal programs that protect agricultural lands and help promote farming practices that benefit wildlife and help protect water quality. Through our private lands program, we will help direct landowners who are interested in these programs to the proper state and Federal agencies and programs. In rare cases, we may acquire agricultural lands from willing sellers, when other options to keep the land in agricultural production are not available, or if habitats for Federal trust resources are in jeopardy from development or other land use changes.

Due to our unfamiliarity with the habitat conditions in the CFA, a comprehensive, multi-scale habitat and wildlife inventory will be necessary to implement refuge strategies. This inventory will need to encompass all habitats within the CFA and associated landscape. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Assess the condition of pasture, hay and grassland habitats, as well as the overall size and location in the CFA, and proximity to other forest openings, to inform more detailed management strategies in an HMP.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including American eel.

***Rationale:***
The lower reaches of the Fort River meanders through the agricultural lands of the Fort River CFA. The Fort River is the longest free-flowing tributary to the Connecticut River in Massachusetts, and ranks near the top among all New England rivers for overall freshwater mussel diversity. The federally endangered dwarf wedgemussel occurs in a portion of the river between Plum and Hop Brooks, about a mile from the CFA boundary. The Fort River also supports American eel, a species petitioned in 2010 for listing under the Endangered Species Act. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit streams, lakes, and ponds. They feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

The Fort River floodplain communities and forested buffers within the Fort River CFA have been cleared for agricultural use or are being threatened by nonnative invasive plant species. Restoration of floodplain communities and forest buffers will improve the water quality of the Fort River by decreasing erosion and siltation, and provide shade for aquatic species. A comprehensive, multi-scale habitat and wildlife inventory will be necessary to understand aquatic and surrounding habitat conditions in the CFA. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable to the Fort River CFA*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable to the Fort River CFA*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to: develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively towards solutions; model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Work with communities, school systems, public and non-profit organizations, and private educational organizations to facilitate and develop quality model environmental education curricula, as well as to develop highly trained individuals to conduct quality environmental education. Priority will be given to urban dwellers as participants and other visitors within a 1-hour commute of the Fort River Division who might not otherwise visit a refuge. Environmental education programs will be designed to:

- Take into account the needs of the target audience, as well as the relevance to the target audience's everyday lives.
- Be student and community-centered.
- Be curriculum-based, with goals and measurable objectives.
- Be inquiry driven and involve direct experiences with nature.
- Involve educators in the development and implementation.
- Be linked to multiple state relevant learning standards.
- Coordinate with state and private environmental educations programs.
- Relate to refuge management goals, objectives, and purposes.
- Have tools for evaluation and measurable outcomes throughout development and execution.
- Involve repeated contact with the same students.

- Be sustainable (i.e., have the resources necessary to continue over the long term).
- Involve interactions that occur in the natural, the built, and the social environment.
- Aim to develop awareness, attitudes, understanding, skills, and feelings of empowerment.

Additionally, the refuge will work with partners to develop and implement quality professional development for educators, to promote the training of refuge staff and volunteers in the knowledge, skills, and abilities of environmental education and to use volunteers, including Friends members, to enhance environmental education opportunities.

***Rationale:***
The long-term vision for the Fort River Division is that it will house an outdoor environmental education facility. This facility will be used by the refuge for environmental education, by local schools looking to use the division as an outdoor classroom, and by local nature centers and conservation organizations working toward shared conservation goals. The Fort River Division will be actively managed, making it a good outdoor laboratory/active management demonstration site. Further, an ADA-compliant trail will provide wildlife dependent recreation opportunities for a wide range of visitors.

As stated in the Chapter 4 rational for Goal 2, environmental education is an important aspect of the Conte Refuge that helps the refuge to meet one of its founding purposes to "provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access." The Fort River Division is located within a 1-hour radius of several population centers including the cities of Springfield, Hartford, Holyoke, Keene, Brattleboro, and their surrounding suburbs. Given this proximity, refuge staff and partners have the ability to work with urban audiences who would not normally visit a refuge on their own. Similarly, the Fort River Division is geographically well situated for the refuge to sustain partnerships with a diversity of local organizations. To name a few, the Fort River Division is located a short distance from facilities and lands owned by: Massachusetts Audubon, the Massachusetts Department of Conservation and Recreation, the Massachusetts Division of Fisheries and Wildlife, the Trustees of Reservation, private nature centers, several colleges and universities, and private science museums. Given its central location within the Connecticut River watershed, the Fort River Division has the potential to be an important dissemination point for visitor services related activities for the refuge. Further, the division is located a short distance from Interstate 91 and Route 9, making it an easy commute for schools looking to partake in environmental educations.

This CFA is well suited for an outdoor environmental education facility because of its location near headquarters and population centers, and because of the ability to re-develop sites currently occupied by derelict buildings, resulting in minimal ecological impacts.

**Management Strategies:**
*Within 5 years of EE facility completion:*

- Design or adapt curricula for the Fort River Division that focuses on watersheds and local natural and cultural resources. Curricula will:
  - ✓ Incorporate multiple relevant learning standards.
  - ✓ Coordinate with existing state and national environmental educations programs.
  - ✓ Take into account student and teacher needs by researching and analyzing demographics and the geographic area by taking into consideration cultural differences, student life experiences, specific learning needs, assessing what is relevant to student's lives, and by addressing the needs of school systems).
  - ✓ Be refuge/place-based.
  - ✓ Incorporate nationally recognized education initiatives, when appropriate.
  - ✓ Be designed with specific goals and objectives.
  - ✓ Promote refuge purposes.

- ✓ Contain consistent interpretive messages and themes.
- ✓ Promote other refuge divisions and units, partner-conserved lands, and facilities such as state parks, science museums, and nature centers as environmental educations resources.
- ✓ Incorporate nationally recognized initiatives (e.g., North American Association of Environmental Education (NAAEE), and Science, Technology, Engineering, and Math (STEM)).
- ✓ Incorporate national based curricula (e.g., Project WILD, Project Aquatic WILD, Project WET, Flying Wild, Project Learning Tree.

- Identify and strive to engage non-traditional audiences regarding environmental education opportunities.
- Support the Service's initiatives with regards to environmental education.
- Contribute to professional educator development by hosting and/or instructing at least two educator continuing education trainings.
- Promote the Fort River Division as a destination for field trips and increase the number of students by two percent per year for the 5 five years.
- Develop an outreach program to promote the Fort River Division as a fieldtrip destination.
- Conduct a needs assessment of after school programs, and summer camps to determine community demand for these types of programs at the refuge.
- Be viewed as a valuable environmental education resource within the community that:
  - ✓ Has staff trained in environmental education and natural resources;
  - ✓ Provides educators with state-of-the-art education resources;
- Develop specific environmental education goals and objectives for each program/lesson and identify appropriate educational strategies for environmental education participants.
- Work with after school programs and summer camps to incorporate existing state watershed curricula.
- Provide support for curriculum-based programs such as Scouts, 4H, Boys and Girls Clubs, Road Scholar (former ElderHostel program), etc.
- Support state environmental education programs (e.g., Hunter and Angler Education, Furbearer Education, Becoming an Outdoors Woman etc.)
- Keep current with state-of-the-art technologies and incorporate them into environmental education programming.
- Work with partners to create issue-oriented experiential activities and programs for use at the Fort River Division.

*Within 10 years of EE facility completion:*

- Coordinate with each state to share environmental education resources.
- Provide the Fort River CFA as an outdoor classroom.

**Inventory and Monitoring Strategies:**

*Within 5 years of CCP approval:*

- Develop an evaluation system to assess the effectiveness of all environmental education curricula.

**Sub-objective 2.1b. (Environmental Education Delivery**
Work with communities, school systems, public and non-profit organizations, private educational organizations, staff, volunteers, and members of friends groups to offer quality environmental education programs at the Fort River Division and at schools and partner facilities within the watershed. Priority will be given to urban dwellers as participants and other visitors within a 1-hour commute of the Fort River Division who might not otherwise visit a refuge.

The refuge will seek to:

- Formally partner with local schools within a 1-hour commute of the Fort River Division and to conduct environmental education to these audiences multiple times per year.
- Promote partner lands as outdoor classrooms, and to help deliver priority educational programs.
- Facilitate the use of refuge and partner lands by educator-, teacher-, and student-led classes.

***Rationale:***
See rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 5 years of CCP approval:*
- Use staff, volunteers, and members of Friends groups to facilitate teachers and students at the Fort River Division. The intention is to host up to ten classes the first year and increase the number of students by two percent per year for the next 5 years.
- Partner with other education centers, state-sponsored programs and other government agencies to meet environmental education objectives.
- Collaborate with the Recreation and Education committee of the Friends of Conte to identify, package, and promote applications for alternative sources of funding for environmental education partnerships.
- Promote partner lands and facilities as outdoor classrooms; help deliver priority educational programs at those partner facilities.

*Within 10 years of CCP approval:*
- Formalize cooperative relationships with environmental education providers through development of agreements and MOUs.
- Develop more detailed environmental education objectives and strategies as part of a Visitor Services Plan.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Formally evaluate the quality of existing environmental education programs and as a result of evaluation, plan for the next 5 years.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
Work with communities, public and non-profit organizations, staff, volunteers, and members of Friends groups to offer quality interpretive programming and training at the Fort River Division.

***Rationale:***
As stated in the Chapter 4 rational for Goal 2, interpretation is an important aspect of the Conte Refuge that helps the refuge to meet one of its founding purposes to "provide opportunities for scientific research,

environmental education, and fish and wildlife-oriented recreation and access." The Fort River Division is located a short distance from Interstate 91 and Route 9, and within a one-hour radius of several urban areas including Springfield, Hartford, Holyoke, Keene, Brattleboro, and their surrounding suburbs. The geographic location of the Fort River Division makes it easy for visitors to access the property, to partake in wildlife dependent activities, and to learn about the habitats and wildlife present at the location. A an outdoor classroom developed on the site will orient visitors to the refuge and to the various divisions available to visit in the watershed. Further, the Fort River will include an ADA-compliant trail for both self-guided interpretation as well as guided interpretive experiences.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.
- Collaborate with partners to create meaningful, consistent, thematic statements to be used in the delivery of programming at the Fort River Division.
- Develop more detailed interpretive objectives and strategies as part of a Visitor Services Plan.
- Develop a core set of interpretive programs that can be modified on an as needed basis.
- Provide resources and trainings to refuge staff, Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop self-guided interpretive services, such as interpretation for the trail and kiosks, exhibits, and printed media.
- Establish relationships with Tribes and local and watershed historians to incorporate cultural history into interpretive programs.
- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members, and the general public, with priority given to refuge affiliates.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with partners to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Annually provide quality interpretive programs, exhibits, printed media at the Fort River Division.
- Provide roving interpretation at visitor center to initiate discussion and encourage engagement in key refuge messages.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Develop self -guided interpretive messages and use state-of-the-art, as well as traditional media such as pamphlets and signs.

*Within 10 years of CCP approval:*

- Design, fabricate, and install an interpretive Conte Corner at the Fort River Division.

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

**Sub-objective 2.3a. (Local Residents, Community Leaders, and Elected Officials)**
Through effective outreach, the refuge will work to increase public awareness of the benefits of the Fort River Division within the surrounding communities. Individuals will become aware of public offerings, resources, and programs offered at the Fort River Division, and of the interpretive messages of the Silvio O. Conte National Fish and Wildlife Refuge.

***Rationale:***
The Conte Refuge is unique with its jurisdictional boundaries encompassing the entire Connecticut River watershed. The 2.3 million residents of the Connecticut River watershed live in urban, suburban, and rural areas, and make up a diverse demographic with varying attitudes and interests. When Congressman Silvio O. Conte proposed the creation of the refuge, his desire was to restore and maintain a swimmable, boatable, and fishable Connecticut River for his children and grandchildren. This dream is still a primary guiding factor for management at the refuge; yet, the full dream can only be realized through the cooperation and combined effort of watershed residents, Federal, state, and local agencies, non-profit organizations, and other community organizations. Strategic, quality outreach targeted at specific audiences is vital to communicate with individuals about watershed and refuge concerns, to work toward a shared vision for the Connecticut River watershed and to gain support for refuge activities.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Develop outreach messages.
- Maintain good lines of communication with Fort River Division neighbors and local community leaders.
- Create special programming that will draw local residents and media.
- When possible, participate in community events and festivals within a 1-hour commute of the Fort River Division.
- Cooperate with neighboring landowners whenever practical and appropriate to conduct land management activities for mutual benefit.
- In conjunction with the Friends group, conduct open houses that showcase center achievements and key center supporters.
- Work quickly to resolve points of conflict between the refuge and its neighbors over issues such as visitor trespass and other inappropriate public use.
- Attend select board meetings, and visit town clerks, mayors, planners, and other elected officials as needed to keep them apprised of refuge issues and projects.

*Within 10 years of CCP approval:*

- Proactively meet with elected officials to share and update each other on constituent concerns and opportunities.
- Develop messages and actions that frame refuge units as an asset to the local community. Example benefits that the refuge provides the community include: environmental education and interpretation programming, special events hosted for the community, employment for local youth through Youth Conservation Corps (YCC), mutual aid agreements, etc.

- Develop and implement an outreach plan for communicating with area residents about the importance of this area to the larger watershed and describe how they can contribute to improving watershed quality. Possible components would include demonstration sites, behind-the-scene tours, special open houses, and technical publications.

- Monitor and evaluate the need for future outreach efforts.

**Sub-objective 2.3b. (State and National-level Elected Officials)**
Through effective outreach to Congress and State officials, as needed, the refuge will work to increase awareness of the benefits of the Fort River Division and the Silvio O. Conte National Fish and Wildlife Refuge.

***Rationale:***
See rationale for sub-objective 2.3a.

**Management Strategies:**
*Continue to:*
- Provide briefings to members of Congress and state officials, or their staff as needed or as requested.

*Within 5 years of CCP approval:*
- Evaluate and modify outreach efforts, as necessary.

**Sub-objective 2.3c. (Media)**
Through effective outreach to the media, the refuge will work to increase public awareness of the Fort River Division and the Silvio O. Conte National Fish and Wildlife Refuge within the surrounding communities. Individuals will become aware of public offerings, resources, and programs offered at the Fort River Division, and of the interpretive messages of the refuge.

**Management Strategies:**
*Within 1 year of CCP approval:*
- Write press releases detailing large refuge projects and accomplishments, and the joint efforts and accomplishments of the refuge and refuge partners.

*Within 5 years of CCP approval:*
- Develop and implement an outreach plan that uses state-of-the-art technology to disseminate program information and Fort River Division offerings to the public.

- Host local media representatives at the Fort River Division.

- Create special programming that will draw the media.

- Routinely use community-based outreach methods such as newspapers and local access television to publicize refuge events and run public service programming on environmental issues.

*Within 10 years of CCP approval:*
- Evaluate media outreach efforts to develop future strategies customized to the division.

**Sub-objective 2.3d. (Greater Watershed Community)**
Through effective outreach, the refuge will work to increase public awareness of the Fort River Division and the Silvio O. Conte National Fish and Wildlife Refuge within the greater watershed communities. Individuals will become aware of public offerings, resources, and programs offered at the Fort River Division, and of the interpretive messages of the Silvio O. Conte National Fish and Wildlife Refuge.

**Management Strategies:**
*Continue to:*
- Coordinate effectively with partners, particularly through the Friends of Conte, to disseminate key messages to their membership.

*Within 1 year of CCP approval:*

- Encourage landowners to take advantage of cooperative land management programs available through the Service and other agencies such as Natural Resources Conservation Service (NRCS) as a way of enhancing environmental quality on and around the refuge.

- On an ongoing basis, but at least annually, use appropriate media to introduce residents to the refuge, describe refuge accomplishments, detail visitor opportunities, and discuss refuge operations and current and future refuge projects.

*Within 5 years of CCP approval:*

- Implement an Adopt-a-Habitat program to be used in part as an outreach tool for schools and community residents to learn about and become stewards of their local environment.

- Conduct open houses on refuge divisions and partnership areas to introduce residents and local officials to the refuge.

- Train Friends, and other volunteers to make presentations on topics of mutual interest to community groups such as Chambers of Commerce, Rotary Clubs and other civic and non-profit organizations.

*Within 10 years of CCP approval:*

- Develop and implement an outreach plan for communicating conservation messages with landowners. Plan would include tools and strategies. Tools could include landowner workshops, behind-the-scene tours, special open houses, and relevant publications.

- Write issue driven outreach plans to keep elected officials informed of refuge and partner accomplishments and of issues within the watershed that have possible impacts to the refuge.

- Develop at least one Conte Corner within the Pioneer Valley.

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

***Rationale:***
One of the six legislative purposes guiding the establishment of the Silvio O. Conte National Fish and Wildlife Refuge was "…to provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access to the extent compatible with other purposes ..." The Fort River Division is situated in the "Five College" area of western Massachusetts and is within a short commute of the University of Massachusetts. The number of nearby local colleges, as well as the abundance of natural and cultural resources in the local area makes the Fort River Division a key resource for students seeking mentoring experiences, and for students looking to conduct research projects relating to conservation, wildlife management, resource protection, and human dimensions. Similarly, student research will benefit the refuge by answering management questions, and helping to guide management strategies.

**Sub-objective 2.4a. (Institutions of Higher Learning and Other Partners)**
Develop and/or enhance relationships with institutions of higher learning, particularly those within a 1-hour commute of the Fort River Division.

**Management Strategies:**
*Continue to:*

- Collaborate with professors at local institutions of higher learning to use the Fort River Division to perform wildlife-related research of interest to the refuge.

- Work with partners to conduct research relevant to refuge management issues.

*Within 5 years of CCP approval:*

- Become an active partner in the Five Colleges Consortium.
- Conduct classes, seminars, and workshops at local colleges that deal with refuge purposes and lands.

**Sub-objective 2.4b. (Technology and Information Exchange)**
Participate, coordinate, and/or host professional conferences, workshops and seminars related to wildlife biology, wildlife management, environmental education and interpretation at the Fort River Division.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Encourage staff to participate in relevant environmental education and interpretation conferences to share exemplary practices.
- Promote the Fort River Division as a venue for institutes of higher learning and professional societies to disseminate information on important watershed issues.

**Sub-objective 2.4c. (Mentoring)**
Provide quality mentoring opportunities for local students and interested individuals.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Offer student internships and host field trips.
- Continue to participate periodically in presenting information to classes at local universities, colleges, and high schools.
- Seek opportunities to participate in student workshops, trainings, and events.

*Within 10 years of CCP approval:*

- Mentor students to help them identify their career goals and introduce career paths within the Service.
- Participate in undergraduate and graduate level classes at local universities and colleges, presenting information on various topics and issues of the refuge.

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following State and refuge division-specific regulations.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. The Fort River Division has been a popular area with hunters for many years prior to acquisition by the Service. All of the division is currently open to hunting under an interim pre-acquisition compatibility determination, excluding safety zones around buildings. Retaining hunting opportunities at this division, consistent with the final

compatibility determination, conforms to historic use on this property and much of the surrounding land in the area. Popular game species include white-tailed deer, Eastern wild turkey, and Eastern cottontail rabbits. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
*Continue to:*

- Allow hunter access to the refuge outside of the normal division open hours, which are 30 minutes before sunrise and 30 minutes after sunset, as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Allow temporary tree stands and blinds that meet State hunting regulations and do not harm trees or other vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunting season.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain hunting consistent with State hunting regulations and the following d-specific regulation:
  - ✓ Temporary blinds and tree stands are permitted, but must have the owner's name and address visible on the stand and the stand must be removed at the end of the hunting season.
- Install an informational kiosk to post information on hunting seasons and other notices to visitors.

*Within 5 years of CCP approval*

- Work with Massachusetts Department of Fish and Game to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Fort River Division kiosks, through a friends group, and in local businesses.

*Within 5 years of CCP approval:*

- Offer to host hunter education field courses.
- Work with Massachusetts Department of Fish and Game to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Fort River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Massachusetts Department of Fish and Game regulations, and division-specific conditions, if necessary.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The division has been open to fishing through pre-acquisition compatibility determinations, but no formal opening package or fishing plan has been completed. Although fishing is not as popular as hunting at the Fort River Division, there still are opportunities for visitors to fish the reach of the Fort River that flows through the division.

**Management Strategies:**
*Continue to:*

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Fort River Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of CCP approval:*

- Work with the Massachusetts Department of Fish and Game to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine whether the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Although most dedicated anglers will be drawn to the nearby Connecticut River, or other areas better known for fishing, the reaches of the Fort River on the division do offer opportunities.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at the division kiosk, through friends groups, and in local businesses.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Fort River Division.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this part of the state. Currently, the refuge is constructing a one-mile long, fully accessible loop trail, scheduled for completion in 2014. Once completed, this trail will attract people to the division and help broaden the support base.

**Management Strategies:**
*Continue to:*

- Allow wildlife observation and photography at the Fort River Division.
- Allow public access at the Fort River Division daily from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

*Within 1 year of CCP approval:*

- Construct an informational kiosk to post information and notices for visitors.

*Within 5 years of CCP approval:*

- Construct an interpreted loop trail meeting ADA guidelines, a new parking lot east of the riding arena, and an informational kiosk at the parking lot.

*Within 10 years of CCP approval:*

- Develop a public access strategy and required planning (i.e., NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the division.

***Rationale:***
The entire division is available for wildlife observation and photography; however, there are steps the refuge can take to enhance their time on the division. Visitation increases are expected as this division expands and becomes better known. By providing new visitors a quality experience, they are more likely to return and tell friends. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Produce a wildlife and plant species guide for the Fort River Division that will be available on the refuge website, at the refuge headquarters, and at division kiosks.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups to offer wildlife-related trips to the division.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Fort River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

*Not applicable at Fort River Division*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Fort River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote and distribute information about these opportunities.

**Management Strategies:**
*Within 5 years of acquiring new lands:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Fort River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate, and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division. Each of these must be found to be both appropriate and compatible to be an authorized use of the refuge.

**Management Strategies:**

*Continue to:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

*Within 1 year of CCP approval:*

- Work with users to delineate winter cross-country trail opportunities and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of the priority public uses by special use permit.

*Within 5 years of CCP approval*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Mill River Conservation Focus Area (Existing Refuge Division)

## Northampton and Easthampton, Massachusetts

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 2,359 | 79.1 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *249* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *2,110* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 922 | 28.1% |
| Total Acres in CFA[2, 4] | 3,281 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS. [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The Mill River area was a SFA in the 1995 Conte FEIS and the refuge's Mill River Division was established in 2007. The proposed Mill River CFA offers the opportunity to restore a functioning floodplain wetland complex along the westbank of the Connecticut River. Additional protection in this CFA by the Service will help better connect existing conserved lands, including MassAudubon's Arcardia Wildlife Sanctuary and Mt. Tom State Reservation.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Swamp – 19.8%
- Freshwater Marsh – 2.4%
- Pasture/Hay/Grassland – 43.8%

For more information on the habitats in the unit, see map A.29 and table A.22.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.23 below, there are seven priority refuge resources of concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and migratory landbirds. These species and others are discussed further below

1. **Federal Threatened and Endangered Species**
   The Puritan tiger beetle, a federally listed species, occupies beach habitat in the northeast portion of the CFA along the Connecticut River. The river flow dynamics of the Connecticut River restricts woody plant growth, provides sparsely vegetated and open sandy beaches required by these beetles. This beach habitat is owned by Massachusetts Division of Fisheries and Wildlife and the city of Northampton. The recovery criteria in the USFWS Puritan Beetle Recovery Plan specifies that a minimum of three metapopulations, at least two of which are large (500 to 1000 or more adults) are maintained

or established (i.e., self-maintained for at least 10 years) within the species historical range along the Connecticut River, and habitat they occupy is permanently protected (Hill and Knisley 1993). The 2007 5-year review recommended that a high priority be given to identifying private landowners that would be willing to enter into conservation easements for the protection and management of Connecticut River shoreline habitat supporting beetles (USFWS 2007). The current tiger beetle population in the CFA is below 100 individuals, and population levels seem to be declining (Davis 2012). This single population is isolated from the metapopulation in Connecticut.

There is a historic location of dwarf wedgemussel, a federally listed species, in the Mill River Division near Pynchon Meadows located west of the CFA. This species requires stable bank conditions afforded by gravel or sandy substrates, and good water quality (Hill and Knisley 1993, Nedeau et al. 2000). An inventory of this area will be necessary to determine dwarf wedgemussel presence, and to assess current habitat suitability.

The shortnose sturgeon, a federally listed species, uses the section of the Connecticut River adjacent to the CFA during migration. American eel, a species petitioned for federal listing, feeds in the mainstem and Mill River.

2. **Migratory Birds**
The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006).The Mill River CFA is situated on the Connecticut River, and the hardwood swamps and upland forested acres provide stopover habitat for migrants in the spring and fall such as wood thrush, Canada warbler, black-throated blue warbler, black-throated green warbler, red-eyed vireo, American redstart, and yellow-bellied sapsucker. Restoration and connectivity of floodplain communities in the CFA will provide additional quality migratory and breeding habitat.

3. **Waterfowl**
The freshwater marshes, hardwood swamps, and open water habitats provide important stop-over areas for migrating and wintering waterfowl. Large concentrations of American black ducks, green-wing teal, mallard, and American wigeon use habitats in this CFA. Other species include Canada geese, bufflehead, canvasback, wood duck, northern pintail, gadwall, and mergansers.

4. **Diadromous fish and other aquatic species**
The Mill River CFA is located along the Connecticut River which provides important habitat for PRRC species including American shad, shortnose sturgeon, American eel, blueback herring, and Atlantic salmon. Shortnose Sturgeon is a federally listed species, and American eel has been petitioned for listing under the ESA. The lower portion of the Mill River also supports river herring. Sea lamprey, another species of conservation concern, also occurs in this CFA providing important ecological benefits to aquatic systems.

5. **Wetlands**
There are approximately 2,000 acres of floodplain habitat in the Mill River CFA. This floodplain is adjacent to the city of Northampton, and due to the rich soils, has mostly been converted to agriculture land. Six hundred and thirty-seven acres of hardwood swamp, 31 acres of shrub swamp and floodplain forest, and 76 acres of freshwater marsh are the current wetland habitats in the floodplain. The Nature Conservancy considers the floodplain forest that occurs in this CFA, and in other areas along this section of the Connecticut River, as ecologically important. These remnant floodplain forests contain some of the largest floodplain trees, and likely the most fertile soils in the watershed (Marks et al 2011).

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested, and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will focus on restoration of degraded floodplains, including where appropriate restoring the primary natural disturbance mechanism (seasonal flooding) and species composition and structure to accepted historical conditions. Management of upland forests will improve structural diversity and species composition will be appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

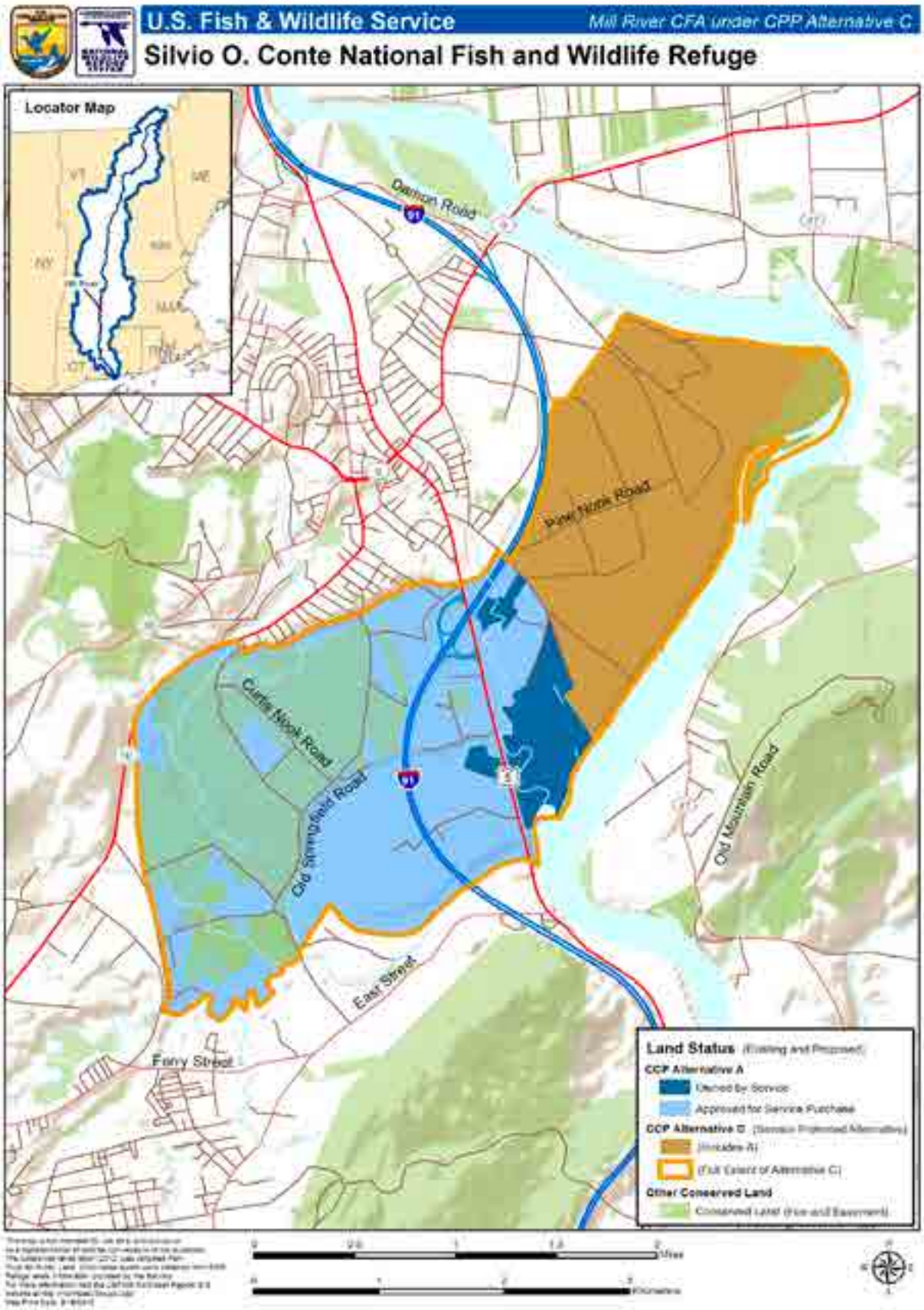
- We will also manage the emergent and shrub wetland habitats, and will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (stream, rivers, and coves) habitats, we will focus on maintaining stream connectivity, establishing riparian buffers, and reducing run-off from the surrounding landscape. Continue to support research projects, and work with partners, including the Service's Endangered Species Office, to manage and monitor the Federally listed species that occur in the CFA.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: fishing, hunting, wildlife observation and photography, interpretation, and environmental education.

*Map A.28. Mill River CFA – Location.*



*Map A.29. Mill River CFA – Habitat Types.*

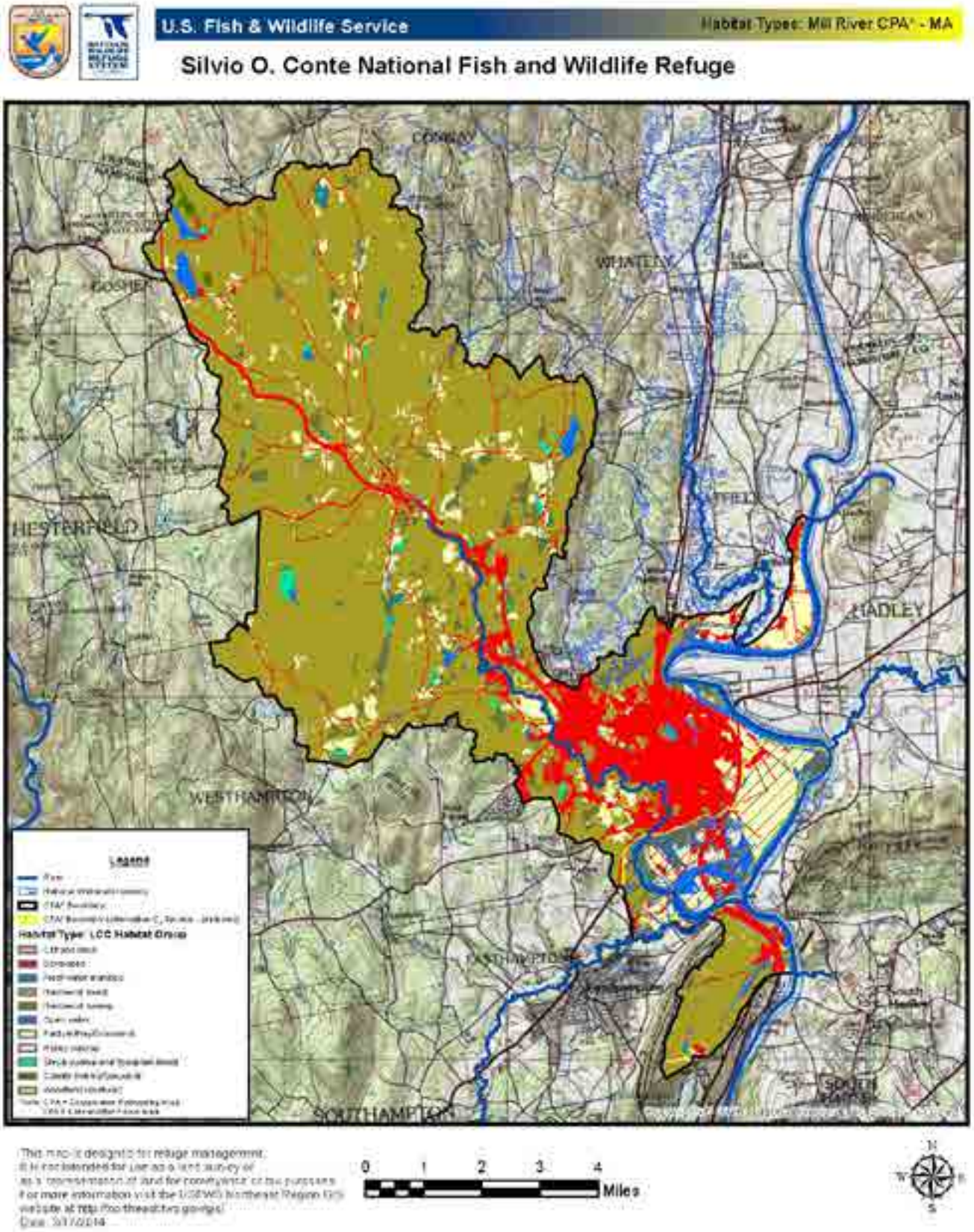


**Table A.22. Mill River CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 78 | 0.2% | 0 | 0 | 0 | 0.0% | 0.0% |
| Hardwood forest | 29,607 | 65.6% | 286 | 183 | 8 | 8.9% | 1.0% |
| Hardwood swamp | 2,225 | 4.9% | 637 | 347 | 108 | 19.8% | 28.6% |
| Shrub swamp and floodplain forest | 303 | 0.7% | 31 | 13 | 0 | 1.0% | 10.4% |
| Woodlands (natural) | 137 | 0.3% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Forested uplands and wetlands subtotal* | *32,350* | *71.6%* | *954* | *543* | *117* | *29.6%* | *2.9%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 61 | 0.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| Freshwater marshes | 275 | 0.6% | 76 | 57 | 6 | 2.4% | 27.8% |
| Pasture/hay/grassland | 4,278 | 9.5% | 1,412 | 226 | 17 | 43.8% | 33.0% |
| Rocky outcrop | 2 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *4,616* | *10.2%* | *1,488* | *283* | *23* | *46.2%* | *32.2%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1,555 | 3.4% | 321 | 32 | 106 | 10.0% | 20.7% |
| *Inland aquatic habitats subtotal* | *1,555* | *3.4%* | *321* | *32* | *106* | *10.0%* | *20.7%* |
| **Other** | | | | | | | |
| Developed | 6,634 | 14.7% | 460 | 61 | 6 | 14.3% | 6.9% |
| *Other subtotal* | *6,634* | *14.7%* | *460* | *61* | *6* | *14.3%* | *6.9%* |
| **TOTAL** | **45,156** | **100.0%** | **3,223** | **855** | **252** | **100.0%** | **7.1%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.23. Mill River CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 286 acres** | | |
| Appalachian (hemlock)-northern hardwood forest[H]<br><br>Northeastern interior dry-mesic oak forest[H] | Northern hardwoods such as sugar maple, yellow birch, and American beech are characteristic of the *Appalachian (hemlock)-northern hardwood forest*, either forming a deciduous canopy or mixed with eastern hemlock. Other common and sometimes dominant trees include Oak (most commonly red oak), tulip poplar, black cherry, and black birch. *Northeastern interior dry-mesic oak forests* are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. Soils are acidic and relatively infertile but not strongly drought prone. Oak species characteristic of dry-mesic conditions (e.g., red oak, white oak, black oak, and scarlet oak and hickory are dominant in mature stands. Chestnut oak may be present but is generally less important than the other oak species. American chestnut was a prominent tree before chestnut blight eradicated it as a canopy constituent. Red maple, black birch, and yellow birch may be common associates. With a long history of human habitation, many of the forests are early in their development following disturbance, where white pine, Virginia pine, or tulip poplar may be a dominant or codominant presence. On hills and slopes within these forests, pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with red maple, swamp white oak, or black tupelo characteristic (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Swamp[5] - 637 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North-central interior wet flatwoods[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. Eastern hemlock is usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North-central interior wet flatwoods* usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, akeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. Pin oak typically dominates and is often associated with swamp white oak and Red maple. American sweetgum and black tupelo are also common associates. Understory herbaceous and shrub species present in examples of this system can vary. Some common species include sedges, cinnamon fern, common buttonbush, alder, and holly (Gawler 2008). | Migratory species |
| **Shrub Swamp and Floodplain Forest[5] - 31 acres** | | |
| Laurentian-Acadian wet meadow-shrub swamp[H] | *Wet meadow-shrub-swamps* are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and grass dominance; typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Trees are generally absent and, if present, are scattered (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 76 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Migratory species |
| **Pasture/Hay/Grassland[5] – 1,412 acres** | | |
| Where appropriate and supported by the local community, restore to floodplain forest | *Laurentian-Acadian floodplain forest* occur along medium to large rivers, and include a matrix of upland and wetland habitats. Floodplain forests, with silver maple are characteristic, as well as herbaceous sloughs and shrub wetlands. Most areas are underwater each spring; micro-topography determines how long the various habitats are inundated. Associated trees include red maple and American hornbeam, the latter frequent but never abundant. On terraces or in more calcium rich areas, sugar maple or red oak may be locally prominent, with yellow birch and ash, black willow is characteristic of the levees adjacent to the channel. Common shrubs include silky dogwood and viburnum. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern-dominated understory in many areas by mid-summer. Non-forested wetlands associated with these systems include shrub-dominated and grass-non-woody vegetation (Gawler 2008). | Migratory species |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water, including River Shoreline Habitat[5] – 321 acres** | | |
| Puritan Tiger Beetle[B, D] | Breeding and wintering habitat includes sparsely vegetated or open sandy beaches along large rivers where river flow dynamics restrict woody plant growth (USFWS 1993). | Sea Lamprey[I]<br>Eastern Silvery Minnow[I]<br>Burbot[I]<br>Black Dace[I]<br>Longnose Sucker[I]<br>**Slimy Sculpin[I]**<br>Creek Chubsucker[I]<br>Longnose Dace[I]<br>Spring Salamander[I]<br>Brook Snaketail[I]<br>Arrow Clubtail[I] |
| **Dwarf Wedgemussel[B, D, F]** | Inhabits creeks and small rivers, prefers the stable bank conditions afforded by gravel or sandy substrates, and good water quality (Nedeau et al. 2000, USFWS 1993). | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | |
| **Shortnose Sturgeon[B, D, F, G]** | Spawn in slow-moving, 48 F water of large rivers, and feed in fresh and brackish water along the river bottom (USFWS 1996). | |
| Blueback Herring[F, G] | Spawn in fast moving, shallow water when the river temperature is about 58 F (USFWS 1996). | |
| **American Shad[B, F, G]** | Spawn when the water temperature is above 60° F in shoal area of river and lower reaches of larger tributaries (USFWS 1996). | |
| **Atlantic Salmon[B, F, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 30.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 30.

I: 2005 Massachusetts Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Objectives and Strategies for Refuge Lands in the Mill River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
We envision healthy forests within the Mill River CFA where a diverse seral structure provides suitable habitat conditions for a suite of Massachusetts wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011)

Mill River CFA hardwood forests provide a diversity of habitats for wildlife. To date our review of the Mill River CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Mill River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Mill River are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and where appropriate, move succession forward to emulate later seral stage characteristics.

Migrating landbirds are typically unable to deposit sufficient fat stores to fly nonstop between breeding and nonbreeding areas (Blem 1980) and must use stopover habitats for feeding and resting before continuing migration. Studies have shown migrating birds exhibit selective use of some habitats over others (Moore et al. 1990, Petit 2000, Rodewald et al. 2004). In general, taller, more structurally diverse vegetation types within an area appear to support greater numbers of migrating birds than do habitats of lower stature and complexity (Moore et al. 1990, Noss 1991). Clearly, structurally complex habitats will not be suitable for all migratory species, but our conservation goal is to provide those areas used most frequently by migrating birds, suggesting relatively tall, structurally diverse habitats may best serve this purpose. The plasticity in habitat use exhibited by most species during migration (Moore et al. 1990, Petit 2000) suggests that many species are able to effectively use the food resources and cover afforded by structurally complex habitats. While our management goals may create a relatively old forest, hardwood forests within Mill River will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird

species with a range of foraging opportunities. Patches of mature edge-dominated (i.e. forest-agricultural edge and suburban forest of the type within Mill River) and shrub-sapling stage forests were used most frequently by fall stopover migrants in a Pennsylvania study (Rodewald et al. 2004).

In a mature forest, many migrating bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Mill River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of foraging opportunities. Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral shrub-sapling habitat rich in fruits and insects important to migrating birds (Noss 1991, DeGraaf et al. 2006). Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, see also Rawinski 2008).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible. In particular, focus on:

  ✓ Managing invasive species that weaken or kill native trees (such as oriental bittersweet) or prevent their regeneration (such as exotic bush honeysuckle).

  ✓ Removing amur corktree before it reproduces and spreads.

  ✓ Regularly monitoring for Japanese stiltgrass, mile-a-minute vine, and other new invaders.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

**Sub-objective 1.1a. (Hardwood swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
Occurrences of hardwood swamps within the Mill River Conservation Focus Area (CFA) represent a number of natural communities. Historically they have undergone significant alteration, and have great potential for restoration. Where this habitat occurs along riparian and floodplain areas it is often found in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the watertable drives complexes of forest upland and wetland species including pin oak, red maple, swamp white oak, sweetgum, and blackgum. The examples identified within the Mill River CFA largely occur within the floodplain of the Connecticut River. Within the Mill River floodplain, hardwood swamps may be found in basins, or on gently sloping seepage lowlands within small patches where an acidic substrate of mineral soil, often with a component of organic muck, creates a shallow, perched water table. Saturation remains seasonal and unique species mixtures result, including eastern hemlock, red maple, and blackgum.

These two systems do share a common disturbance history; agricultural practices, development pressures, and selective logging have largely removed these habitats from the landscape, or greatly simplified their historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats. Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within the Mill River will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats, natural levees, backwater sloughs, and oxbow lakes will create high-quality habitat for spring and fall migrant birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites shown to be important during the energy-intensive migration (Petit 2000).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complements adjacent land management.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Restore native species composition and structure, and improve the natural hydrology, as needed, to support natural and rare shrub swamp and floodplain forest ecological communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
The shrub swamps in the Mill River CFA are restricted to poorly drained areas and small seepage zones within the hardwood swamp communities in the CFA. These shrub swamp systems can have a patchwork of shrub and grass dominance, and may include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). Based on our coarse-scale habitat analysis, the shrub swamps are also adjacent to development and agricultural land, which may have impacted the hydrology of the wetland. Water pollution and invasive species introductions are also threats for shrub swamp communities.

Restoration of shrub swamp communities, as well as the surrounding forested habitat, will create high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Mill River CFA is situated on the Connecticut River, and can provide significant stopover habitat for migrants in the spring and fall. Neo-tropical migrants typically use similar habitats during migration as they do during the breeding season (Petit 2000). Species such as gray catbird, yellow-rumped warbler, white-eyed vireo, eastern phoebe, eastern kingbird, and common yellowthroat will use shrub habitats during migration (McCann et al. 1993). Native shrubs will provide migrants with soft mast and abundant insects to replenish fat reserves, and structure to provide rest and adequate cover from predators and inclement weather.

In 2003, before this unit was purchased, refuge staff began leading volunteers to control invasive water chestnut in one of the ponds. The patch of forested floodplain between the two ponds is one of the few places on the division devoid of invasive plant species, perhaps due to frequent or long-term inundation. However, along the edge of this patch, Oriental bittersweet is taking hold and could pose a possible threat in the event of a local hydrological alteration. In 2012, refuge staff and Youth Conservation Corps crews began cutting bittersweet that was threatening overstory trees. Success in protecting the mature floodplain forest trees from bittersweet will be a long-term process. Other invasive species on the division include exotic bush honeysuckle, garlic mustard, purple loosestrife, Japanese barberry. One early detection species, Amur corktree, was identified within the floodplain forest.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Continue to control known invasive plant infestations. In particular:

- ✓ Control oriental bittersweet that threatens canopy trees and young floodplain trees by pulling smaller plants and cutting larger stems of bittersweet. Follow-up cutting by treating cut stems and resprouting foliage with herbicide.
- ✓ Treat black locust using herbicides and by following best management practices *(http://mnfi.anr.msu.edu/invasive-species/BlackLocustBCP.pdf).*
- ✓ Control Amur corktree and other new invasive species that are known to withstand flooding to protect the regeneration of floodplain forest.

- Coordinate with the Massachusetts Natural Heritage and Endangered Species Program and the local Conservation Commission to ensure invasive plant management complies with the Massachusetts Endangered Species Act and the Massachusetts Wetland Protection Act.
- During the development of the Habitat Management and Integrated Pest Management Plans, assess the threats to native plants from invasive plants and develop priority invasive plant management strategies to limit these threats.
- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.1a. (Freshwater Marshes)**
Restore native species composition and structure, and improve the natural hydrology, as needed, to support natural and rare ecological freshwater marsh communities. Management will provide stopover habitat for spring and fall migrants.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail (Gawler 2008). Based on our coarse-scale habitat analysis, freshwater marsh habitat occurs in the hardwood swamp communities of the Mill River CFA. These wetlands (hardwood swamps and freshwater marshes) are adjacent to development and agricultural land, which may have impacted their hydrology. Water pollution and invasive species introductions are also threats for freshwater marsh communities.

Restoration of freshwater marsh communities, as well as the surrounding forested habitat, will create high-quality habitat for neotropical migratory birds in an otherwise agricultural landscape where small, disturbed forest fragments are the rule. The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Mill River CFA is situated on the Connecticut River, and can provide significant stopover habitat for migrants in the spring and fall. Neo-tropical migrants typically use similar habitats during migration as they do during the breeding season (Petit 2000). These freshwater marshes may provide stopover habitat for rails, egrets, and bitterns.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions

and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Restore historic composition and structure, and improve the natural hydrology and landscape connectivity to support natural and rare ecological communities. Management will provide stopover habitat for migratory species.

***Rationale:***
Sixty-four percent of the Mill River CFA is agricultural land, which is grouped in the more practical Pasture/Hay/Grassland habitat type for the CCP. These agricultural fields lay within the active floodplain of the Connecticut River. This floodplain encompasses the lower portion of the Mill River, and is a natural flood storage area for the surrounding communities.

The topography and natural processes of floodplain systems result in the development of complex upland and wetland vegetation on generally flat topography, and soils deposited by the river. The Mill River CFA has this diversity of habitats in areas not cleared for agricultural use. Hardwood forests and swamps, shrub swamps, and freshwater marsh are part of the floodplain. Silver maple is a characteristic species of a floodplain forest, as well as red maple, ash, red oak, and yellow birch. Common shrubs include black willow, silky dogwood, and viburnums. The herbaceous layer within the forested portions of the floodplain, include spring ephemerals and ferns (Gawler 2008).

Restoration of this floodplain will provide a more contiguous and diverse breeding and migratory habitat for a variety of wildlife species. The Mill River CFA is significant migration habitat as it is located along the Connecticut River, an important migratory corridor (Smith College 2006). A restored floodplain will also improve its function to retain and slow flood waters, reducing the extent of damage to the surrounding communities, and thereby improving water quality.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Restore agricultural land as it becomes available and with local support, either through tree plantings or natural processes.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water and River Shore)**
In collaboration with partners, identify and implement habitat restoration opportunities within the Mill River CFA and Connecticut River to benefit priority refuge resources of concern including American shad, shortnose sturgeon, American eel, blueback herring, Atlantic salmon, dwarf wedgemussel, and Puritan tiger beetles, as well as other species of conservation concern such as sea lamprey.

***Rationale:***
The Mill River CFA provides habitat for a diversity of aquatic and river shoreline species. The Connecticut River and associated tributaries provides migration and feeding habitat for American shad, shortnose sturgeon,

American eel, blueback herring, and Atlantic salmon. The main stem shoreline within the CFA supports a population of federally listed Puritan tiger beetles. Dwarf wedge mussel, also a federally listed species, occurred historically in the CFA near Pynchon Meadows.

Shortnose sturgeon, a federally listed species, and Atlantic salmon use this section of the Connecticut River during migration. Blueback herring, American shad and American eel use the mainstem and the Mill River which runs through the CFA. American eel, a species petitioned for federal listing, feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems, their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

The Puritan tiger beetle, a federally listed species, uses beach habitat in the northeast portion of the CFA along the Connecticut River. The river flow dynamics of the Connecticut River restricts woody plant growth, provides sparsely vegetated and open sandy beaches required by these beetles. This beach habitat is owned by MA Wildlife and the city of Northampton. The recovery criteria in the USFWS Puritan Beetle Recovery Plan specifies that a minimum of three metapopulations, at least two of which are large (500-1000+ adults) are maintained or established (ie. self-maintained for at least 10 years) within the species historical range along the Connecticut River, and habitat they occupy is permanently protected (Hill and Knisley 1993). The current tiger beetle population in the CFA is below 100 individuals, and population levels seem to be declining (Davis 2012). Encroaching vegetation and recreational activities on the beach and Connecticut River are contributing factors toward this instability.

There is a historic location of dwarf wedgemussel, a federally listed species, in the Mill River Division near Pynchon Meadows. This species requires stable bank conditions afforded by gravel or sandy substrates, and good water quality (U.S. Fish and Wildlife Service 1993, Nedeau et al. 2000). An inventory of this area will be necessary to determine dwarf wedgemussel presence, and to assess current habitat suitability.

Restoration of upland and wetland habitats in the Mill River CFA will improve water quality of these river systems by eliminating erosion, and providing forest or wetland buffers to reduce sedimentation and filter out contaminants in riparian areas. We will work with partners to provide clear aquatic species passage to spawning habitat, and assist with fish population research and monitoring. We will also assist with conducting education of the local community to decrease recreational impacts on the Puritan tiger beetle, and remove vegetation from beach habitat to improve conditions for beetle larvae. Baseline information on the condition of the water resources, and associated upland and wetland habitats in the CFA will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan (HMP).

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to reduce combined sewer overflow affecting aquatic resources.
- Work with adjacent landowners to eliminate barriers to aquatic species passage.
- Continue to support Puritan tiger beetle research opportunities.
- Hand-pull or apply herbicide to encroaching vegetation in Puritan tiger beetle larval habitat.

*Within 10 years of land acquisition and CCP approval:*

- Work with partners to protect and increase “hard bottom” (e.g., gravel, cobble, or bedrock) for spawning aquatic species.
- Work with partners to educate the general public about recreational use impacts on Puritan tiger beetle populations using outreach, visitor contact, restricted access and other tools, as warranted.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with the USFWS New England Endangered Species Office to inventory area for dwarf wedgemussel, and assess habitat conditions to determine if restoration of aquatic habitat is appropriate.

- Work with partners, to continue to inventory Puritan tiger beetle populations to allow further analysis of population trends.

*Within 10 years of CCP approval:*

- Monitor recreational use activities to address recurring issues and impacts to Puritan tiger beetle populations

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2:** Education, Interpretation, and Outreach: Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Mill River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Mill River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Mill River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Mill River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Mill River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Mill River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Mill River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Mill River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Mill River Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Mill River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Mill River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. The Mill River Division has been a popular area with hunters for many years prior to acquisition by the Service and has been open under a pre-acquisition compatibility determination. Retaining hunting opportunities at this division conforms to historic use on this property and much of the surrounding land in the area. Popular game species include white-tailed deer, Eastern wild turkey, waterfowl, and cottontail rabbits. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
*Continue to:*

- Allow hunter access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Install an informational kiosk to post information on hunting seasons and other notices to visitors.

*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Mill River Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Offer to host hunter education field courses.
- Work with Massachusetts Department of Fish and Game to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Mill River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Massachusetts Department of Fish and Game regulations, and division-specific conditions, if necessary.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The division has been open to fishing, following acquisitions, through a pre-acquisition compatibility determination, but no formal opening package or fishing plan has been completed. Fishing from the banks of the Connecticut River and Magnolia and Triangle ponds on the division are popular recreational activities.

**Management Strategies:**
*Continue to:*

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Mill River Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Although most anglers will be drawn to the Connecticut River or other areas better known for fishing, the Mill River offers the opportunity to fish for game fish including sunfish and bullhead. Visitors unaware of this available resource may choose to participate while on the division.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Mill River Division.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this part of the state. Currently, there is no infrastructure in place at the division to support this use, and consequently, visitation for wildlife viewing and photography is limited. Allowing people to engage in wildlife observation and photography is in keeping with the nature of the area.

**Management Strategies:**
*Continue to:*

- Allow wildlife observation and photography at the Mill River Division.

- Allow public access at the Mill River Division daily from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

*Within 1 year of CCP approval:*

- Construct an informational kiosk to post information and notices for visitors.

*Within 10 years of CCP approval:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the division.

***Rationale:***
The entire division is available for wildlife observation and photography; however, there are steps the refuge can take to enhance their time on the division. Visitation increases are expected as this division expands and becomes better known. By providing new visitors a quality experience they are more likely to return and tell friends. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Produce a wildlife and plant species guide for the Mill River Division that will be available on the refuge website, at the refuge headquarters, and at division kiosk.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups to offer wildlife-related trips to the division.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Mill River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route.

*Within 5 years of CCP approval:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway trail.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Mill River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Mill River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate, and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division. Each of these must be found to be both appropriate and compatible to be an authorized use of the refuge.

**Management Strategies:**
*Continue to:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

*Within 1 year of CCP approval:*

- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Westfield River Conservation Focus Area (Existing Refuge Division)

## Washington, Middlefield, and Becket, Massachusetts

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 6,520 | 88.8 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *125* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *6,395* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 819 | 11.2% |
| Total Acres in CFA[2, 4] | 7,339 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The refuge's existing Westfield River Division was established in 2013. The proposed Westfield River CFA is part of an area identified by the State of Massachusetts as a priority for conservation. It would offer the opportunity to conserve lands along a high-quality segment of the Westfield River that supports a cold-water fisheries, such as eastern brook trout. The proposed CFA is located in an area with an extensive conserved lands network, including the Gilbert A. Bliss and Dead Branch State Forests, the Chesterfield Gorge Reservation (Trustees of Reservations, the Hiram H. Fox, Brewer Brook, and Fisk Meadows Wildlife Management Areas, and U.S. Army Corps of Engineers Land (Knightville Dam and Indian Hollow). Additional land protection by the Service in this area will help better connect these conserved lands.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 90.4%
- Shrub swamp and floodplain forest – 0.8%
- Conifer Swamp/Spruce-Fir – 2.1%

For more information on the habitats in the CFA, see map A.31 and table A.24.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.25 below, there are nine priority refuge resources of concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) and species that require large contiguous forest tracts including forest interior dwelling bird species. These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   American eel, a species petitioned for Federal listing occurs in the Westfield River CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit the CFA streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with this use concentrated in habitats along the Connecticut River main stem. Migrants become more evenly distributed in watershed habitats beyond the Connecticut River main stem (Smith College 2006). The Westfield River CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

   The Westfield River CFA is within the West Branch of the Westfield River Watershed which provides a contiguous core of mostly undeveloped forested acres. The mosaic of habitat types and undeveloped contiguous forested acres in the Westfield River CFA supports a diversity of breeding landbirds, including species of conservation concern and forest interior dwelling species. These include PRRC species such as wood thrush, blackburnian warbler, chestnut-sided warbler, American woodcock, and Canada warbler. This CFA is in the core range for many other species of conservation concern including black-throated blue warbler, black-throated green warbler, ruffed grouse, ovenbird, veery and purple finch.

3. **Waterfowl**
   Potential breeding and foraging habitat for American black duck, a PRRC species, wood duck, Canada geese, and other waterfowl species within wetlands adjacent to slow moving streams and open water habitats.

4. **Diadromous fish and other aquatic species**
   The West Branch of the Westfield River flows through the town of Becket along the southwest portion of the CFA. This branch is a free-flowing river with very few aquatic barriers along its tributaries. The West Branch, and two of its tributaries, Coles Brook and Factory Brook provide important cold water habitat for PRRC including brook trout and Atlantic salmon. Other cold aquatic species that occur within this watershed include slimy sculpin, lake chub, and many species of invertebrates such as mayflies, stoneflies, caddisflies. American eel, a species petitioned in 2010 for listing under the Endangered Species Act, as well as a PRRC species and state SGCN, also occurs in the Westfield River CFA.

5. **Wetlands**
   The Westfield River CFA contains 19 acres of hardwood swamp, 157 acres of conifer swamp, 63 acres shrub-swamp, and floodplain forest, and 10 acres of freshwater marsh. Many of these wetlands occur along slow moving streams or small ponds. Habitat patches range from 2 acres to 57 acres in size.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide a diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and species composition will be appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (stream, rivers, ponds) habitat, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

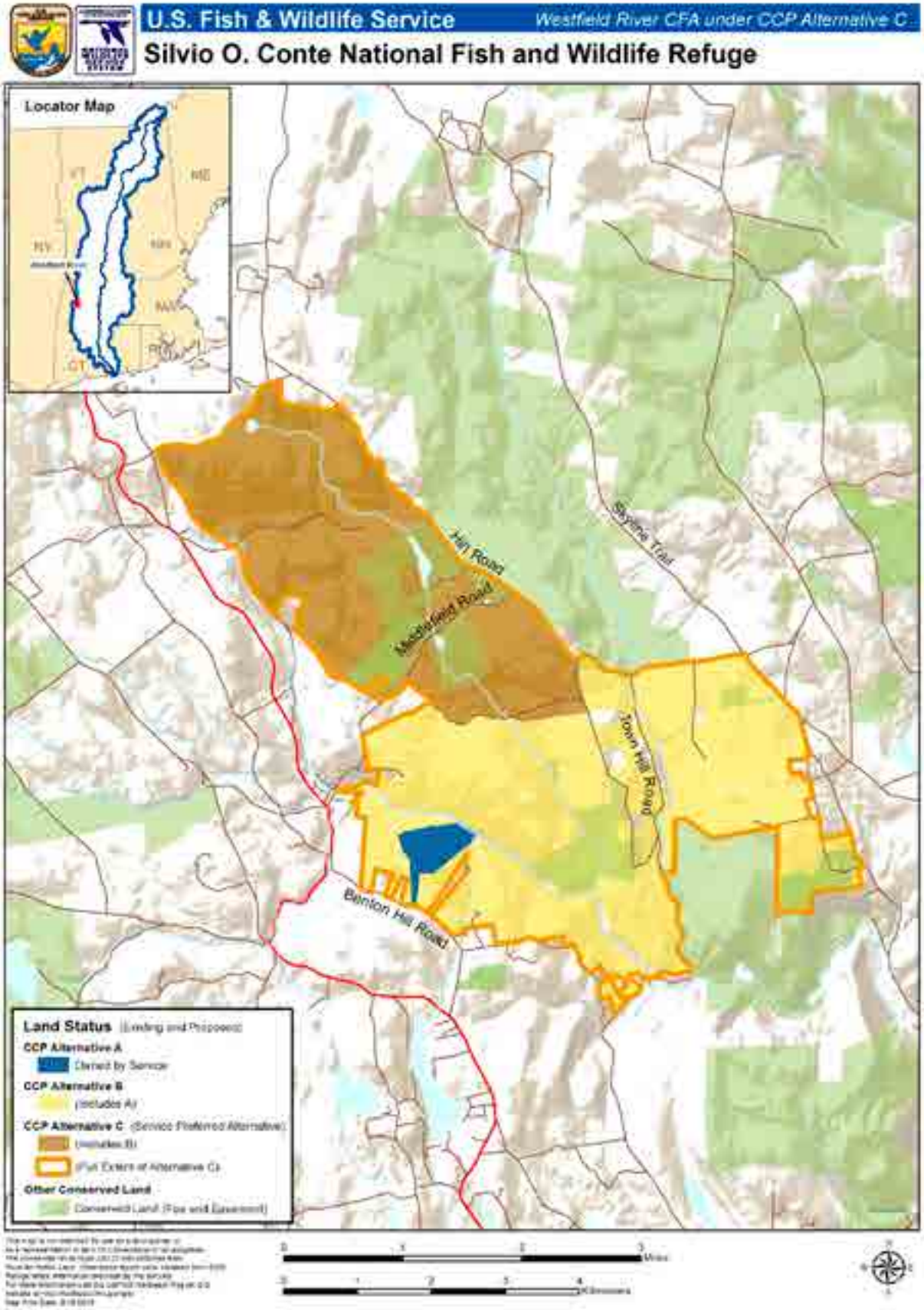
## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, interpretation, and environmental education.

## Were there other special considerations in delineating the CFA boundary?

The Westfield River Watershed has been recognized by The Nature Conservancy, the State of Massachusetts and the National Wild and Scenic Rivers program as one of the most intact river systems in Massachusetts and one of the healthiest tributaries to the Connecticut River. The watershed is currently over 80 percent forested and only 4 percent developed, remarkable for southern New England. The West Branch within the Westfield River CFA is 91 percent forested, 6 percent in wetlands and other natural cover, and only 3 percent developed.

*Map A.30. Westfield River CFA – Location.*



*Map A.31. Westfield River CPA – Habitat Types.*

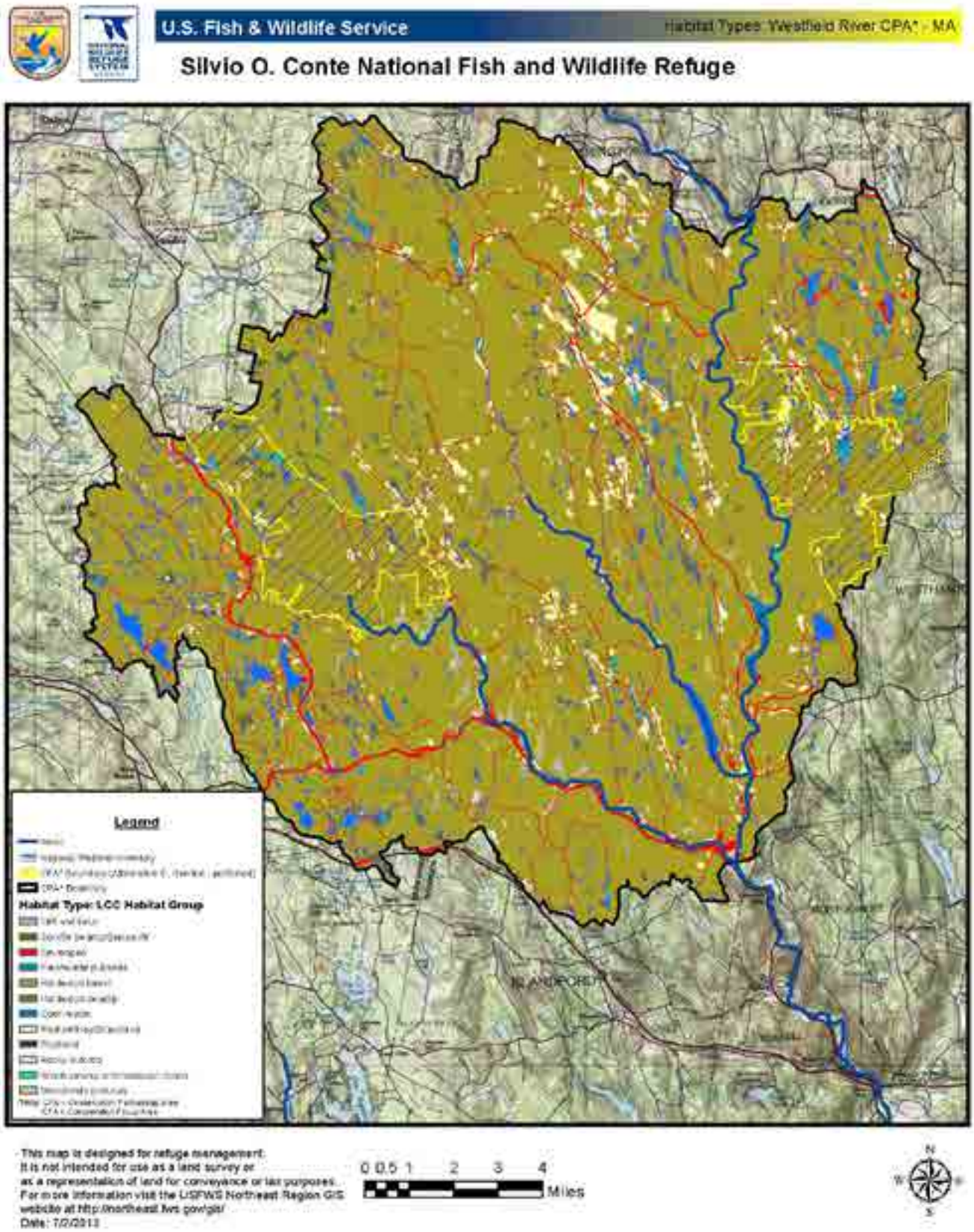


**Table A.24. Westfield River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 1,712 | 1.1% | 157 | 22 | 0 | 2.1% | 9.2% |
| Hardwood forest | 127,161 | 85.3% | 6,815 | 720 | 0 | 90.4% | 5.4% |
| Hardwood swamp | 2,447 | 1.6% | 19 | 0 | 0 | 0.3% | 0.8% |
| Shrub swamp and floodplain forest | 1,018 | 0.7% | 63 | 6 | 0 | 0.8% | 6.2% |
| Woodlands (natural) | 563 | 0.4% | 32 | 12 | 0 | 0.4% | 5.8% |
| *Forested uplands and wetlands subtotal* | *132,901* | *89.1%* | *7,086* | *759* | *0* | *94.0%* | *5.3%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 775 | 0.5% | 14 | 0 | 0 | 0.2% | 1.9% |
| Freshwater marshes | 676 | 0.5% | 10 | 2 | 0 | 0.1% | 1.5% |
| Pasture/hay/grassland | 6,215 | 4.2% | 168 | 22 | 0 | 2.2% | 2.7% |
| Peatland | 4 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky outcrop | 254 | 0.2% | 39 | 0 | 0 | 0.5% | 15.4% |
| *Non-forested uplands and wetlands subtotal* | *7,924* | *5.3%* | *232* | *23* | *0* | *3.1%* | *2.9%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1,547 | 1.0% | 60 | 26 | 0 | 0.8% | 3.9% |
| *Inland aquatic habitats subtotal* | *1,547* | *1.0%* | *60* | *26* | *0* | *0.8%* | *3.9%* |
| **Other** | | | | | | | |
| Developed | 6,738 | 4.5% | 157 | 18 | 0 | 2.1% | 2.3% |
| *Other subtotal* | *6,738* | *4.5%* | *157* | *18* | *0* | *2.1%* | *2.3%* |
| **TOTAL** | **149,110** | **100.0%** | **7,535** | **826** | **0** | **100.0%** | **5.1%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.25. Westfield River CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 6,815 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Black-throated Blue Warbler[A]<br>Broad-winged hawk[I,J]<br>Black-billed Cuckoo[A, J]<br>Black-throated Green Warbler[A]<br>Ruffed Grouse[A, I]<br>Whip-poor-will[A, I, J]<br>**Louisiana Waterthrush[I]**<br>Brown Thrasher[I]<br>**Ovenbird[A]**<br>**Eastern Red Bat[I]**<br>Veery[A]<br>American Redstart[A, J]<br>Eastern Box Turtle[I]<br>Four-toed Salamander[I]<br>Sharp-shinned Hawk[I,J]<br>Purple Finch[A]<br>Yellow-bellied Sapsucker[A,J]<br>Black Racer[I]<br>Bobcat[I]<br>Moose[I]<br>Black Bear[I]<br>Rose-breasted Grosbeak[A] |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Chestnut-sided Warbler[A, B, I]** | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |
| **Hardwood Swamp[5] - 19 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North Central Interior and Appalachian rich swamp[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. Eastern hemlock is usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North Central Interior and Appalachian rich swamps* are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include red maple, black ash, as well as calcium loving herbs. Conifers include American larch, but typically not northern white cedar, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp[5] - 157 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average over-story tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | Purple Finch[A,I]<br>Northern Parula[A,I] |
| **Shrub Swamp and Floodplain Forest[5] - 63 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands, and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | Chestnut-sided Warbler[A]<br>Ruffed Grouse[A, I]<br>**Warbling Vireo**<br>**Spotted Turtle[I]**<br>American Redstart[A, J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>Wood Duck[J]<br>Eastern Towhee[I]<br>White-throated Sparrow[I]<br>**Willow Flycatcher[I]**<br>Canada Goose[A] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Woodlands (natural)[5] - 32 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] - 14 acres** | | |
| Laurentian-Acadian acidic cliff and talus[H]<br><br>North-central Appalachian circumneutral cliff and talus[H] | These cliff systems occur at low to mid elevations, well below treeline. The vegetation within the *Laurentian-Acadian acidic cliff and talus system* is patchy and often sparse, punctuated with patches of small trees such as birches and spruce species. Species that prefer calcium rich soils are absent. In north-facing or other sheltered settings where cold air accumulates at the bottom of slopes, a shrubland of heaths and reindeer lichens can develop. Eastern red cedar is a characteristic tree species, poison ivy a characteristic woody vine, and common polypody a characteristic fern. Substrates within the *circumnuetral cliff and talus system* include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood, and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Freshwater Marshes[5] - 10 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **Marsh Wren**<br>**American Bittern[A,I]**<br>Northern Harrier[A,I,J]<br>Spotted Turtle[I]<br>Northern Leopard Frog[I]<br>Canada Goose[A,J]<br>New England Bluet[I]<br>Eastern Ribbon Snake[I]<br>Wood Duck[J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland[5] – 168 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[I,J]<br>Northern Harrier[A,I,J]<br>**Bobolink[A,I]**<br>**Eastern Meadowlark[I]**<br>**Grasshopper Sparrow[I]**<br>Black Racer[I]<br>White-throated Sparrow[I]<br>American Kestrel[I]<br>Northern Leopard Frog[I]<br>Willow Flycatcher[I]<br>Prairie Warbler[I]<br>Chestnut-sided Warbler[A, B, I] |
| **Rocky Outcrop[5] – 39 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | *The Northern Appalachian-Acadian rocky heath outcrop system* occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Low-bush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] – 60 acres** | | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Longnose Sucker[I]<br>Black Dace[I]<br>**Slimy Sculpin[I]**<br>Creek Chubsucker[I]<br>Longnose Dace[I]<br>Lake Chub[I]<br>Arrow Clubetail[I]<br>Riffle Snaketail[I]<br>Spring Salamander[I] |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | |
| **Atlantic Salmon[B, F, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2005 Massachusetts Comprehensive Wildlife Conservation Strategy

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Westfield River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, chestnut-sided warbler, American woodcock, Canada warbler, and blackburnian warbler.

***Rationale:***
We envision healthy forests within the Westfield River CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Massachusetts wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Forests of the Westfield River CFA blanket a watershed recognized by The Nature Conservancy, the State of Massachusetts, and the National Wild and Scenic Rivers program as one of the most intact river systems in Massachusetts. This intact mosaic of habitats is among the most diverse and productive for wildlife in the Connecticut River watershed, and abundant, high-quality habitat is certainly available within the CFA. To date our review of the Westfield River CFA habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Westfield River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of the Westfield River are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Westfield River will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like refuge

priority species of concern American woodcock, are declining as remaining patches of young forest mature(Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, eastern red bat, and—if wetlands and riparian areas are present—Canada warbler (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Hardwood forests within the Westfield River CFA should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance to species like Canada warbler. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who dwell in the upper canopies of conifers, and are thought to be strongly associated with the hemlock forests within Westfield River. Blackburnian warblers have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (>75-80% closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. Efforts to regenerate a diversity of species must contend with evidence of reduced diversity or damage to tree seedlings and herbaceous plants attributed to white-tailed deer (Hough 1965, Anderson and Loucks 1979, Tilghman 1989, Rooney and Waller 2003, Côté et al. 2004, see also Rawinski 2008). The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—where softwood inclusions are abundant—blackburnian warbler.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that are utilized by species like the northern goshawk. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan (HMP).

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands where soils and species composition will support woodcock management.
- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Collaborate with partners within the Westfield River Watershed Invasive Species Partnership to strategically prevent and manage invasive species within the watershed, including on refuge land.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Conifer Swamps)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for refuge resources of concern including Canada warbler.

***Rationale:***
To date our review of the softwood swamps within the Westfield River CFA has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. These forested wetlands are found on mineral soils that are nutrient-poor; there may be an organic layer, but generally not deep peat. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. Red maple, ash species, red spruce, and balsam fir are often the most typical overstory species present. Where soils tend more to alkaline conditions white cedar is a common tree species, and the shrub layer is generally more diverse. Historically, development pressure and selective logging have removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in softwood swamps are not well understood. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Westfield River will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures where the natural hydrology has been disrupted.

Where needed, restoration of softwood swamp habitats will create high-quality habitat for neotropical migratory birds. Closed canopy softwood forests that include white cedar and other softwoods provide important mast, food, nesting, and cover. Softwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Conifer swamps in the Westfield River CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Conifer swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Westfield River CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition, forest structure, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map vernal pools and seeps.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. Our coarse-scale habitat analysis of this CFA identifies a shrub swamp wetland complex along Cole Brook

and Depot Brook. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of a woodcock management area. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation, and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests near foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife utilization of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species; however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the Service has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Westfield River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the Westfield River watershed.

Our coarse-scale habitat analysis of this CFA identifies freshwater marsh wetlands along Cole Brook. Cole Brook starts at Benson Pond, where approximately five acres of freshwater marsh occurs. This particular wetland may not be overly large, but being adjacent to open water and a slow moving stream may provide foraging, and potentially breeding habitat for American black duck, and other waterfowl species. A mosaic of freshwater marsh and shrub swamp also occurs near The Cove further downstream on Coles Brook. Black ducks use wetlands such as these for breeding and foraging habitat. Well-concealed nests are placed on the ground in adjacent uplands or hummocks within the wetland. Adults and their broods feed on seeds and herbaceous vegetation, including sedges, rushes, and submerged aquatic vegetation, as well as invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for American black duck.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Evaluate wetland hydrology for impacts to natural flow regimes.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

- Inventory wetland plant communities.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Over two percent of the Westfield River CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
See rationale for sub-objective 1.1d.

Habitats that occur within the Westfield River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout, American eel, and Atlantic salmon.

***Rationale:***
The West Branch of the Westfield River flows through the town of Becket along the southwest portion of the CFA. This Branch is a free-flowing river with very few aquatic barriers along its tributaries providing habitat for species of conservation concern such as Eastern brook trout, American eel and Atlantic salmon.

The West Branch, and two of its tributaries, Coles Brook and Factory Brook provide important cold water habitat for brook trout and Atlantic salmon. These species are sensitive to extreme temperature fluctuations, and require water temperatures between 40-70 degrees Fahrenheit for spawning, growth, and survival. Other cold aquatic species that occur within this watershed include slimy sculpin, lake chub, and many species of invertebrates such as mayflies, stoneflies, caddisflies. American eel, a species petitioned for Federal listing and a state species of greatest conservation need, also occurs in Westfield River CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to feed in aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

Management of water resources in the Westfield River CFA will provide clear aquatic species passage to spawning and wintering habitat, as well as structurally diverse, cold in-stream habitat. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a

comprehensive, multi-scale wildlife and habitat inventory. We will work with partners to analyze current available data, and conduct assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.
- Work with partners to conduct stream assessments to identify man-made physical barriers (e.g. impassable road crossings, culverts, and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Westfield River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Westfield River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Westfield River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Westfield River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Westfield River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Westfield River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Westfield River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 year of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Westfield River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Westfield River Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Westfield River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Westfield River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations, except as noted under Strategies below.

***Rationale:***
The Westfield River CFA is a popular area to hunt white-tailed deer, moose, Eastern wild turkey, black bear, and small game. Hunting would be allowed on a newly created division as long as it is found to be a compatible use. Hunting, if found to be a compatible use, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use at the division.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations
- Allow hunter access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are discernible.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Massachusetts Department of Fish and Game to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Westfield River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Offer to host hunter education field courses.

- Work with Massachusetts Department of Fish and Game to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

**Inventory and Monitoring Strategies:**
*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Westfield River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Massachusetts Department of Fish and Game regulations, and division-specific conditions, if necessary.

***Rationale:***
There are several streams in the proposed CFA including the West Branch Westfield River, Middle Branch Westfield River, Fuller Brook, Coles Brook, Factory Brook, and Tuttle Brook. The included branches of the Westfield River supports a cold water fishery with brook trout, brown trout, and rainbow trout. Fishing is a popular activity throughout this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk to post information on fishing seasons and other notices to visitors.

- The Westfield River Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of CCP approval:*

- Produce a brochure that highlights fishing opportunities for distribution at a division kiosk and the refuge website.

- Work with the Massachusetts Department of Fish and Game to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Westfield River Division.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in western Massachusetts. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses at the division.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exceptions listed for hunters, anglers, and snowmobilers. The refuge manager may issue a special use permit for public uses during the closed hours.

- Install an informational kiosk to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that wildlife observation and photography are compatible uses at the division.)

*Within 1 year of acquiring land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups to include wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Westfield River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Westfield River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Westfield River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that the use is both appropriate and compatible at the division.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge properties.

# Great Falls Discovery Center, Massachusetts (Existing Partner Facility)

## What is the Great Falls Discovery Center?

The Great Falls Discovery Center (GFDC) is located in Turners Falls, Massachusetts. It is the flagship visitor center for the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge), and helps the refuge meet one of its founding purposes to provide opportunities for environmental education. GFDC acts as a visitor information and education center for the local region and the greater Connecticut River watershed, and plays an important role in supporting the economic development of the local Turners Falls community. GFDC is a collaborative effort between several organizations that work together to broaden the effectiveness of public education about the Connecticut River watershed's rich fish, wildlife, and cultural resources. The partners include the refuge, Massachusetts Department of Conservation and Recreation, Friends of Great Falls Discovery Center, and the town of Montague.

GFDC orients visitors to the Connecticut River watershed and the Conte Refuge and introduces visitors to the varied habitats and species of the watershed, and presents many of the conservation and management successes and challenges faced by watershed partners. GFDC provides opportunities for visitors to experience the natural environment; to learn about the human relationship with the river's past, present, and future; and to learn about stewardship of the watershed.

The mission of GFDC is to "…educate visitors on the conservation and protection of the Connecticut River watershed…" and to "…provide opportunities to experience the natural environment; to learn about the human relationship with the river's past, present, and future; and to promote stewardship of these resources." This mission is currently attained through environmental education programs, interpretation, and community outreach.

## What public use opportunities are proposed for Great Falls Discovery Center?

The GFDC provides a space for environmental education and interpretative programs. Actions proposed in this plan will prioritize, increase, and strengthen refuge involvement in environmental education, interpretation, and community and scientific outreach, reinforcing GFDC as an important educational resource for the Connecticut River watershed.

# Goals, Objectives, and Strategies for the Great Falls Discovery Center under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

*This goal is not applicable to Great Falls Discovery Center because the refuge does not own any land at the center.*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

***Rationale:***
See the chapter 4 environmental education rationale, which details the importance of environmental education to the Service. During the fall, winter, and spring, the amount of traditional "museum" visitation declines as families return to their school schedules. During this period, center staff concentrate outreach efforts on hosting field trips and conducting quality environmental education with school and homeschool students, both on and off site. The GFDC is an excellent facility for the refuge to host field trips as it houses elaborate dioramas that depict common habitats of the Connecticut River watershed, as well as a multipurpose room that is well suited for educational programs and activities. The small museum-like atmosphere is conducive to focused lessons that allow students to experience realistic representations of the watershed. Further, the center is a short distance from the Northfield Mountain Recreation facility, the Turners Falls Fishway, and other private museums providing the opportunity for partnerships with these facilities.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Work with communities, public and non-profit organizations, and private educational organizations to facilitate and develop quality model environmental education curricula, as well as to develop highly trained individuals to conduct quality environmental education. Priority will be given to urban dwellers as participants and other visitors within a 1-hour commute of GFDC who might not otherwise visit a refuge. Environmental education programs will be designed to:

- Take into account the needs of the target audience, as well as the relevance to the target audience's everyday lives.
- Be student- and community-centered.
- Be curriculum-based, with goals and measurable objectives.
- Be inquiry driven and involve direct experiences with nature.
- Involve educators in development and implementation.
- Link to relevant learning standards.
- Coordinate with state and private environmental education programs.
- Relate to refuge management, objectives, and purposes.
- Have tools for evaluation and measurable outcomes throughout development and execution.
- Emphasize repeated contact with the same students.
- Be sustainable (i.e having the resources to occur over the long-term).
- Involve interactions that occur in the natural, the built, and the social environment.
- Aim to develop awareness, attitudes, understanding, skills, and feelings of empowerment.
- Use a variety of instructional media including traditional classrooms, online courses, field studies, WoW Express visits, Adopt-a-Habitat, etc.

Additionally, the refuge will work with partners to develop and implement quality professional development for educators, to promote the training of refuge staff and volunteers in the knowledge, skills, and abilities of environmental education and to use volunteers, including Friends members, to enhance environmental education opportunities.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Design or adapt curricula for GFDC that focuses on watersheds, natural, and cultural resources. Curricula will:
  - ✓ Incorporate multiple relevant learning standards.
  - ✓ Coordinate with existing state and national environmental education programs.
  - ✓ Take into account student and teacher needs.
  - ✓ Incorporate nationally recognized education initiatives, when appropriate.
  - ✓ Be designed with specific goals and objectives.
  - ✓ Promote refuge purposes.
  - ✓ Contain consistent interpretive messages and themes.
  - ✓ Promote refuge and partner-conserved lands and facilities as environmental education resources.
  - ✓ Incorporate nationally recognized initiatives (e.g., North American Association of Environmental Education (NAAEE), and Science, Technology, Engineering, and Math (STEM)).
  - ✓ Incorporate national based curricula (e.g., Project WILD, Project Aquatic WILD, Project WET, Flying Wild, and Project Learning Tree).
- Work with educators to plan curricula to use at GFDC.
- Identify and strive to engage non-traditional audiences in environmental education.
- Support Service initiatives about environmental education.
- Contribute to professional educator development by hosting and/or instructing at least two educator continuing education trainings.
- Continue to be a destination for field trips and increase the number of students by two percent per year for the next 5 years.
- Develop an outreach program to promote the GFDC as a field trip destination.
- Be viewed as a valuable environmental education resource within the community that:
  - ✓ Has staff trained in environmental education and natural resources.
  - ✓ Provides educators with state-of-the-art education resources.
  - ✓ Offers a variety of teaching tools.
- Develop specific environmental education goals and objectives for each program/lesson and identify appropriate educational strategies for environmental education participants.
- Work with after school programs and summer camps to incorporate existing state watershed curricula.
- Provide support for curriculum-based programs such as Scouts, 4H, Boys and Girls Clubs, Road Scholar (former ElderHostel program), etc.
- Support state environmental education programs (e.g., Hunter and Angler Education, Furbearer Education, Becoming a Great Outdoors Woman, etc.).

- Keep current with state-of-the-art technologies and incorporate them into environmental education programming.

*Within 10 years of CCP approval:*
- Coordinate with each state to share environmental education resources.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Develop an evaluation system to assess the effectiveness of environmental education curricula.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Work with communities, public and non-profit organizations, private educational organizations, staff, volunteers, and members of Friends groups to offer quality environmental education programs at the Great Falls Discovery Center, and at schools and partner facilities within the watershed. Priority will be given to urban dwellers as participants and other visitors within a 1-hour commute of GFDC who might not otherwise visit a refuge.

The refuge will seek to:

- Formally partner with local schools within a 1-hour commute of GFDC to conduct environmental education multiple times per year.

- Promote partner lands as outdoor classrooms, and help deliver priority educational programs.

- Facilitate the use of refuge and partner lands by educator-, teacher-, and student-led classes.

***Rationale:***
See rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 5 years of CCP approval:*
- Use staff, volunteers, and members of Friends groups to facilitate teachers and students at GFDC. The intent is to increase the number of students by two percent per year for the next 5 years.

- Partner with other education centers, state sponsored programs and other government agencies to meet environmental education objectives.

- Collaborate with the Friends of Conte's Recreation and Education Committee to identify, package, and promote applications for alternative funding sources for environmental education partnerships.

- Promote partner lands and facilities as outdoor classrooms; help deliver priority educational programs at those partner facilities.

- In cooperation with the Vermont Institute of Natural Science (VINS), produce, disseminate, and evaluate the effectiveness of watershed education kits.

- Work with local environmental education providers to implement the refuge's Adopt-a-Habitat initiative to help schools and individuals learn about and connect with natural features their local environments.

*Within 10 years of CCP approval:*
- Formalize cooperative relationships with environmental education providers through development of agreements and MOUs.

- Partner with at least six local schools within the watershed and conduct high quality environmental education programs multiple times per year to these audiences. An emphasis will be placed on urban areas and other visitors within a 1-hour commute of GFDC who might not otherwise visit a refuge.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
Collaborate with partners to develop quality interpretive programming, facilities and other media for GFDC that identify and relate natural and cultural history, and refuge management strategies of the watershed's natural systems. Information conveyed will forge emotional and intellectual connections between the interests of the audiences and the habitats and wildlife that exist within the watershed in order to instill stewardship values.

***Rationale:***
See chapter 4 interpretation rational for a description of its importance to the Service. Located within close proximity of Interstate 91, and Routes 5, 10, and 2, and within an hour of several cities including Springfield and Holyoke, and their surrounding suburbs, GFDC is a destination for travelers. The center houses elaborate dioramas that depict the habitats of the Connecticut River watershed and compel visitors from all geographic areas to learn about the refuge and the watershed. Further, the historical nature of the building, as well as the rich natural, geologic, cultural, and industrial history of the surrounding communities, affords a multitude of opportunities for center staff to host interpretive program for audiences of all ages. Additionally, the multipurpose room of the center is well suited as a space for educational activities and local partner meetings and draws new visitors who may not visit the center on their own.

The nearby Turners Falls Fishway, owned by FirstLight Power Resources, offers opportunities to view migrating fish such as sea lamprey and American shad. The fishway consists of three "fish ladders" or stair-like pools that help fish over the Turners Falls dam. Visitors view fish using the ladder from an underwater window.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, media, signs, exhibits) when creating programming for natural and cultural resource interpretation.
- Collaborate with partners to create meaningful, consistent, thematic statements to be used in the delivery of programming at GFDC.
- Develop more detailed interpretive objectives and strategies as part of a Visitor Services Plan.
- Develop a core set of interpretive programs that can be modified on an as needed basis.
- Provide resources and trainings to refuge staff, Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop self-guided interpretive services, exhibits, and printed media.
- Establish relationships with Tribes and historians to incorporate cultural history into interpretive programs.
- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members and the general public, with priority given to refuge affiliates.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with partners to deliver natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Provide quality interpretive programs, exhibits, and printed media at GFDC.
- Provide personal contacts with visitors to initiate discussion and answer questions.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Develop self-guided interpretive messages and use state-of-the-art technology, (e.g., cell ranger/QR codes) as well as traditional media (e.g., pamphlets and signs).
- Work with partners to create issue-oriented experiential activities and programs for use at GFDC.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

**Sub-objective 2.3a. (Local Community Residents, Leaders, and Elected Officials)**
Through effective outreach, the refuge works to increase public awareness of the GFDC within the surrounding communities. Individuals will become aware of public offerings, resources, and programs offered at GFDC, and of the interpretive messages of the Silvio O. Conte National Fish & Wildlife Refuge.

***Rationale:***
See chapter 4 outreach rational for a description of its importance to the Service. The Great Falls Discovery Center is located in the village of Turners Falls in part, to support the economic development of this former mill town. Strategic and effective outreach will sustain local support, allow the center to reach new audiences, and communicate with a variety of visitors, all of which will contribute to meeting desired visitation rates.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Serve on the steering committee and be an active partner of Turners Falls River Culture or other relevant organizations to promote Turners Falls and to support the local economy.
- Maintain good lines of communication with GFDC neighbors and local community leaders and elected officials.
- Create special programming that will draw local residents and media (e.g., participating in community events and festivals, etc.).
- In conjunction with the Friends and DCR, conduct open houses that showcase GFDC's achievements and key GFDC supporters.

*Within 10 years of CCP approval:*

- Evaluate and modify, as necessary, outreach efforts.

**Sub-objective 2.3b. (State and National-level Elected Officials)**
*Not applicable. This type of outreach will occur through staff at the Sunderland Office headquarters and will not specifically occur at this site.*

**Sub-objective 2.3c. (Media)**
Through effective outreach to the media, the refuge will work to increase public awareness of the GFDC within the surrounding communities. Individuals will become aware of public offerings, resources, and programs offered at GFDC, and of the interpretive messages of the Silvio O. Conte National Fish & Wildlife Refuge.

***Rationale:***
See rationale for sub-objective 2.3a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Develop and implement a press plan that uses state-of-the-art technology to disseminate program information and GFDC offerings to the public.
- Write press releases detailing large refuge projects, programs and accomplishments, and the joint efforts and accomplishments of the refuge and refuge partners.
- Host local media representatives at GFDC.

**Sub-objective 2.3d. (Greater Watershed Community)**
*Not applicable. This type of outreach will occur through staff at the Sunderland Office headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Collect and share information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

**Sub-objective 2.4a. (Institutions of Higher Learning and Other Partners)**
Develop and/or enhance relationships with institutions of higher learning within a 1-hour commute of the GFDC.

***Rationale:***
The proximity of the GFDC to five major colleges, including the University of Massachusetts, and its central location in the Connecticut River watershed, makes it a great location to bring experts in the fields of natural resources and education together to share research ideas and technical information. This information exchange mutually benefits both the refuge and participants. Further, GFDC is within close proximity to several colleges that offer specialties in environmental education and education. Students can partake in research opportunities and internships in these fields to gain valuable experience.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Collaborate with professors at local institutions of higher learning to use the GFDC as a venue to highlight and present student work that relates to refuge missions and goals.
- Continue to work with partners to conduct research relevant to refuge management issues including environmental education, interpretation, and human dimensions.
- Develop formal agreements with universities and other partners to host student projects and research in support of the refuge purposes.

**Sub-objective 2.4b. (Technology and Information Exchange)**
Participate, coordinate, and/or host professional conferences, workshops, and seminars related to environmental education and interpretation at GFDC.

***Rationale:***
See rationale for sub-objective 2.4a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Encourage staff to participate in relevant environmental education and interpretation conferences to share exemplary environmental education and interpretation practices.

- Promote GFDC as a venue for institutes of higher learning and professional societies to disseminate information on important watershed issues.

**Sub-objective 2.4c. (Mentoring)**
Provide quality mentoring opportunities for local students and interested individuals.

***Rationale:***
See rationale for sub-objective 2.4a.

**Management Strategies:**
*Continue to:*

- Reach out to local universities to develop student internships and employment opportunities.

- Participate in presenting information to classes at local universities and colleges.

*Within 5 years of CCP approval:*

- Seek opportunities to participate in student workshops, trainings, and events.

*Within 10 years of CCP approval:*

- Develop a mentoring program to work with students to help them identify their career goals and introduce career paths within the Service.

- Participate in undergraduate and graduate level classes at local universities and colleges, presenting information on various topics and issues of the refuge.

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

*This goal is not applicable to Great Falls Discovery Center because the refuge does not manage any recreational facilities at the Center, other than those that support environmental education and interpretation.*

# Overview
# Honeypot Road Wetlands Unit (Existing Refuge Unit)

## Westfield, Massachusetts

| Total Unit Acres[1] | 21 |
|---|---|

[1]Actual acres

## What are the priority habitat types within the unit? What percentage of the total unit acreage do they represent?

- Hardwood forest - 74%
- Hardwood Swamp – 22%
- Pasture/Hay/Grassland – 3%

For more information on the habitats in the unit, see map A.33 and table A.26.

## What are the Federal trust and other natural resource values in the unit?

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem. Migrants become more evenly distributed in habitats in the watershed beyond the Connecticut River main stem (Smith College 2006). The Honeypot Wetland Unit's hardwood forests and swamps provide stopover habitat for landbirds.

2. **Wetlands**
   The State of Massachusetts considers the American clam shrimp to be a "species of concern" under its State endangered species act. The shrimp inhabit ephemeral (vernal) pools. Small numbers of clam shrimp have been recorded at three Massachusetts habitats: a flooded depression in an old pasture field, a flooded hay field depression, and at Honeypot Wetlands along the weedy shoreline of an Atlantic white cedar swamp. We will work with the State to monitor and protect this species, and the vernal pool habitats they occupy.

## What habitat management activities would likely be a priority on the unit?

We will conduct a comprehensive, multi-scale wildlife habitat inventory. Baseline information on the condition of habitats (ie. forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on managing invasive plants to maintain native diversity.

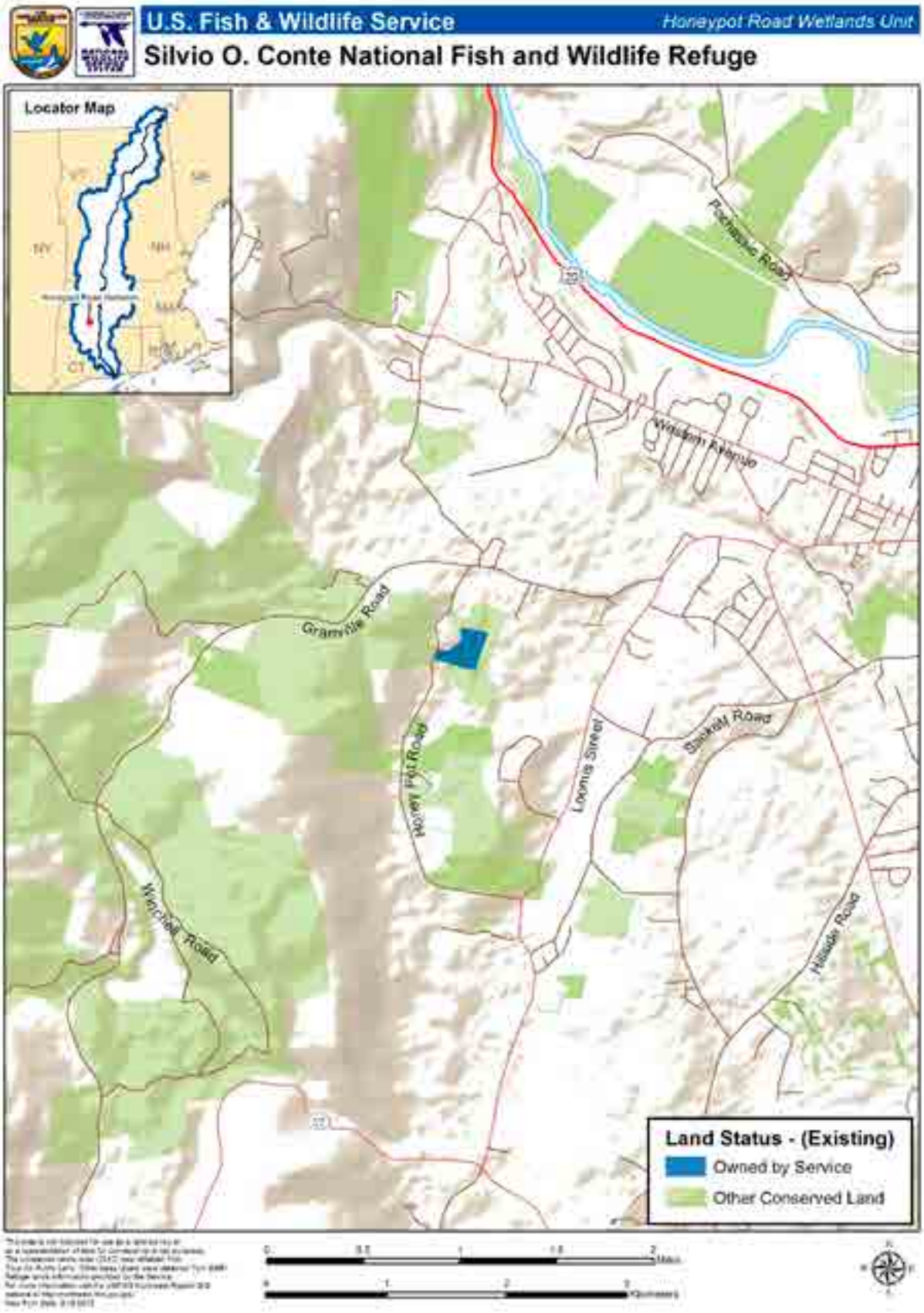
## What public use opportunities would likely be a priority on the unit?

We would focus on providing opportunities for hunting and wildlife observation and photography.

## Does the unit have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

The State-listed American clam shrimp lives within an Atlantic white cedar swamp on the unit.

*Map A.32. Honeypot Road Wetlands Unit – Location.*



*Map A.33. Honeypot Road Wetlands Unit – Habitat Types.*

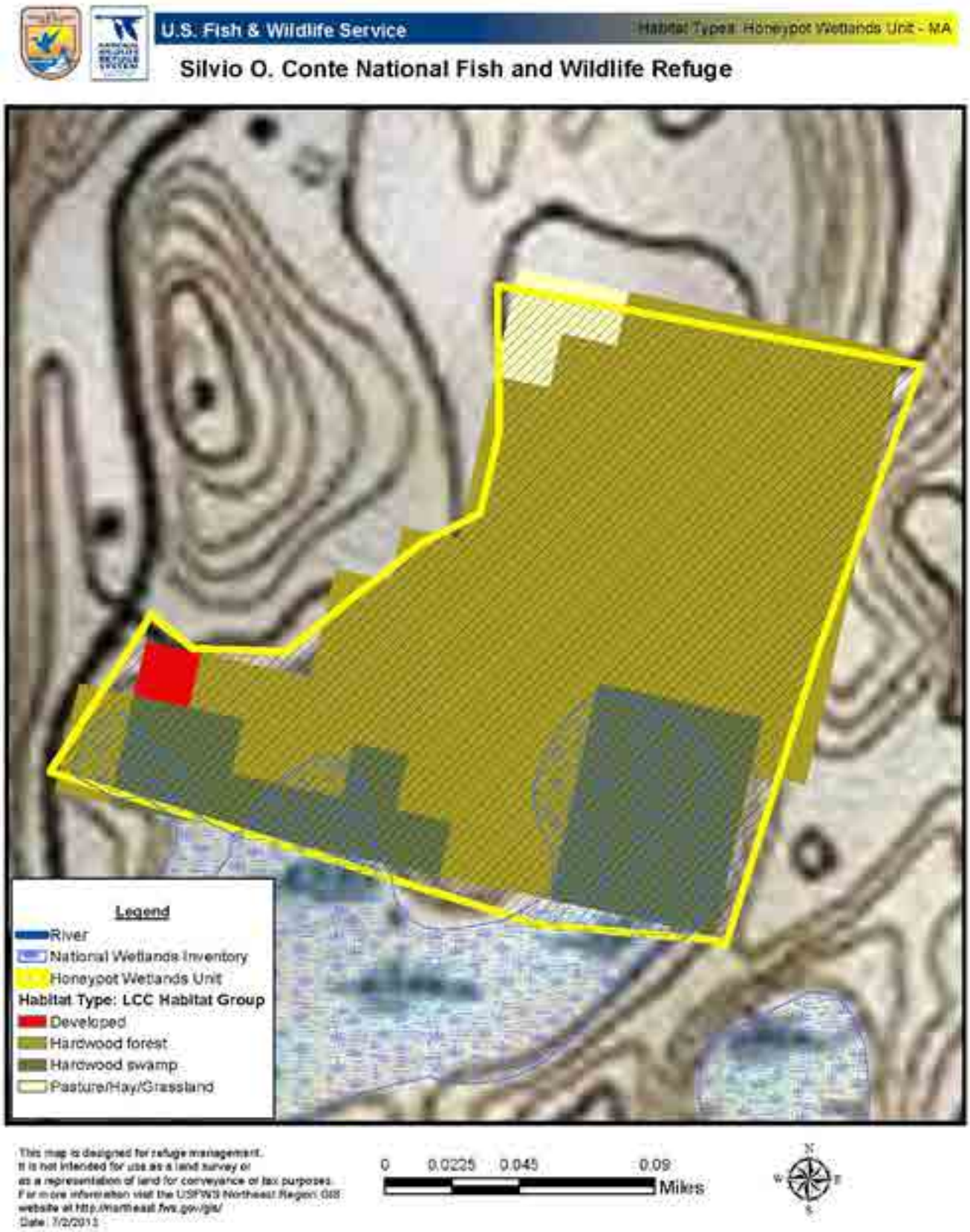


**Table A.26. Honeypot Road Wetlands Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 16 | 74.0% |
| Hardwood swamp | 5 | 21.9% |
| *Forested uplands and wetlands subtotal* | *20* | *95.8%* |
| **Non-forested Uplands and Wetlands[2]** | | |
| Pasture/hay/grassland | 1 | 3.1% |
| *Non-forested uplands and wetlands subtotal* | *1* | *3.1%* |
| **Other** | | |
| Developed | 0 | 1.0% |
| *Other subtotal* | *0* | *1.0%* |
| **TOTAL** | **21** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Honeypot Road Wetlands Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
The Honeypot Wetlands Unit's small size and isolation from other refuge units, has led us to aggregate our objectives and discussion under a single sub-objective that addresses the unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. While achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management, the Service also has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines unit management that will benefit many species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Downed logs in a forest, streams and vernal pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a dead and downed logs, a vernal pool, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem

management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Honeypot Wetlands Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats, by virtue of refuge land ownership, represent small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and provide additional structural and species diversity to the matrix. A vernal pool or an herbaceous wetland, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna – providing ephemeral freshwater habitats for clam shrimp, or herbaceous wetlands for secretive bird species. One could make the case that these ephemeral freshwater habitats are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context.

Some habitats within the unit will be managed under a more classic coarse-filter approach—primarily those areas where the American clam shrimp has been documented. The State of Massachusetts considers the clam shrimp to be a "species of concern" under its State endangered species act. The shrimp inhabit ephemeral (vernal) pools. Small numbers of clam shrimp have been recorded at three Massachusetts habitats: a flooded depression in an old pasture field, a flooded hay field depression, and at Honeypot Wetlands along the weedy shoreline of an Atlantic white cedar swamp. The refuge will continue to monitor this known population for impacts from planned refuge activities.

Combining coarse and fine-scale conservation efforts under the rubric of BIDEH will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually, and more targeted strategies for those rare, threatened, or endangered species like the American clam shrimp. Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the unit is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Monitor impacts to sensitive habitats from public use.
- Work with partners to monitor known American clam shrimp populations.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Honeypot Road Wetlands Unit as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Honeypot Road Wetlands Unit as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Honeypot Road Wetlands Unit as an outdoor classroom.

***Rationale:***
Because this unit will be unstaffed, the majority of environmental education opportunities on this unit will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Honeypot Road Wetlands Unit as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Honeypot Road Wetlands Unit. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. Interpretation is an important tool that can be used to spread the refuge message to private residents and visitors to the refuge. We will develop interpretive materials with information on the unit's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Inventory and evaluate each unit to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Honeypot Road Wetlands Unit.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop standardized self-guided interpretive services, such as kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Honeypot Road Wetlands Unit.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Honeypot Road Wetlands Unit would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Honeypot Road Wetlands Unit would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. The Honey Pot Wetlands Unit (Unit) abuts the state Honey Pot Wildlife Management Area (Honey Pot WMA) which is open to hunting under state regulations. A larger unit of the Honey Pot WMA is close by to the south and the Westfield Wildlife Management Area is across Honey Pot Road, west of the unit. This area has been a popular area with hunters for many years. Allowing hunting opportunities at this unit conforms to historic use on the nearby state wildlife management areas. Popular game species include white-tailed deer, turkey, and cottontail rabbits. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal unit open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the unit and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the unit.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the unit with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Massachusetts Department of Fish and Game facilities, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to encourage youth hunting at the unit as a means of introducing young people to this traditional recreation activity.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
*Not applicable*

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

*This objective is not applicable because there is no permanent surface water on this unit.*

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Honey Pot Wetlands Unit.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this part of the state. Currently, there is no infrastructure in place at this unit to support this use, and consequently, visitation for wildlife viewing and photography is limited. Allowing people to engage in wildlife observation and photography is in keeping with the nature of the area.

**Management Strategies:**
*Continue to:*

- Allow wildlife observation and photography at the Honey Pot Wetlands Unit.
- Allow public access daily from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters.

*Within 1 year of CCP approval:*

- Add information on the Honey Pot Wetlands Unit to the refuge Web site.

*Within 5 years of CCP approval:*

- Determine whether an informational kiosk adjacent to Honey Pot Road is warranted, to provide information about the unit and refuge to visitors.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the unit.

***Rationale:***
The entire unit would be available for wildlife observation and photography; however, since this is a small landholding adjacent to a large area of state-conserved land that is popular with recreationists, no viewing aids would be developed.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 10 years of CCP approval:*

- Produce a wildlife and plant species guide for the Honey Pot Wetlands Unit that will be available on the refuge website and at the refuge headquarters.

**Sub objective 3.3c Watershed-based Partner Initiatives**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Honeypot Road Wetlands Unit that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate, and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the unit. Each of these must be found to be both appropriate and compatible to be an authorized use of the refuge.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow dispersed hiking and snowshoeing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- If interest exists, work with partners to design and market a virtual geocache course at the unit. The course should integrate orienteering with refuge interpretive messages that include linking this unit to other refuge divisions and units.

# Overview
# Mount Toby Unit (Existing Refuge Unit)

## Sunderland, Massachusetts

| Total Unit Acres[1] | 30 |
|---|---|

[1]Actual acres

## What are the priority habitat types within the unit? What percentage of the total unit acreage do they represent?

- Hardwood forest - 98%
- Pasture/Hay/Grassland – 2%

For more information on the unit's habitats, see map A.35 and table A.27.

## What are the Federal trust and other natural resource values in the proposed CFA?

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem. Migrants become more evenly distributed in habitats in the watershed beyond the Connecticut River main stem (Smith College 2006). The Mount Toby Unit's hardwood forest is situated within a larger conserved landscape and serves as important stopover habitat for landbirds.

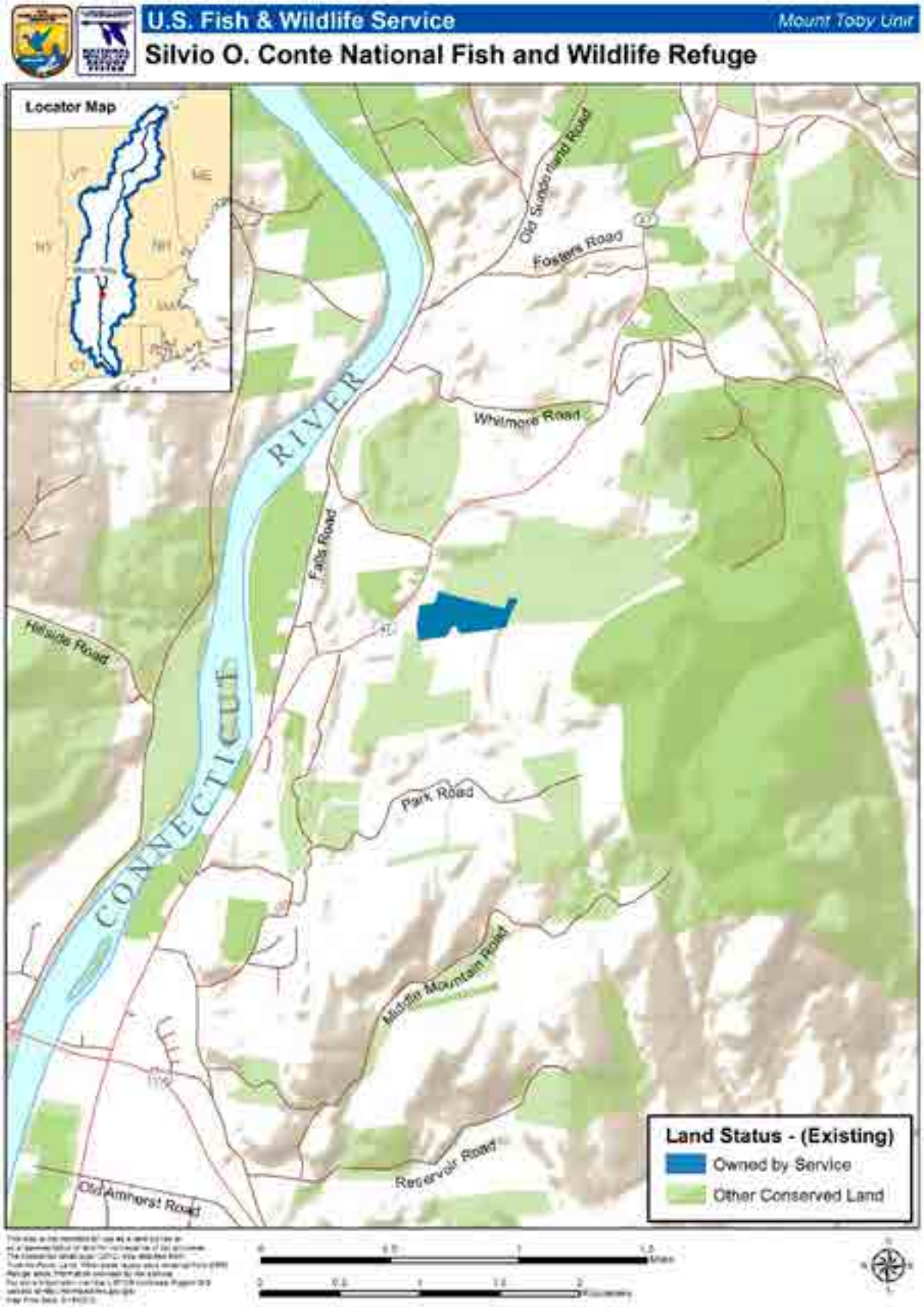
## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory. Baseline information on the condition of habitats (ie. forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on managing invasive plants to maintain native diversity.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for hunting, interpretation, and wildlife observation and photography.

*Map A.34. Mount Toby – Location.*



*Map A.35. Mount Toby – Habitat Types.*

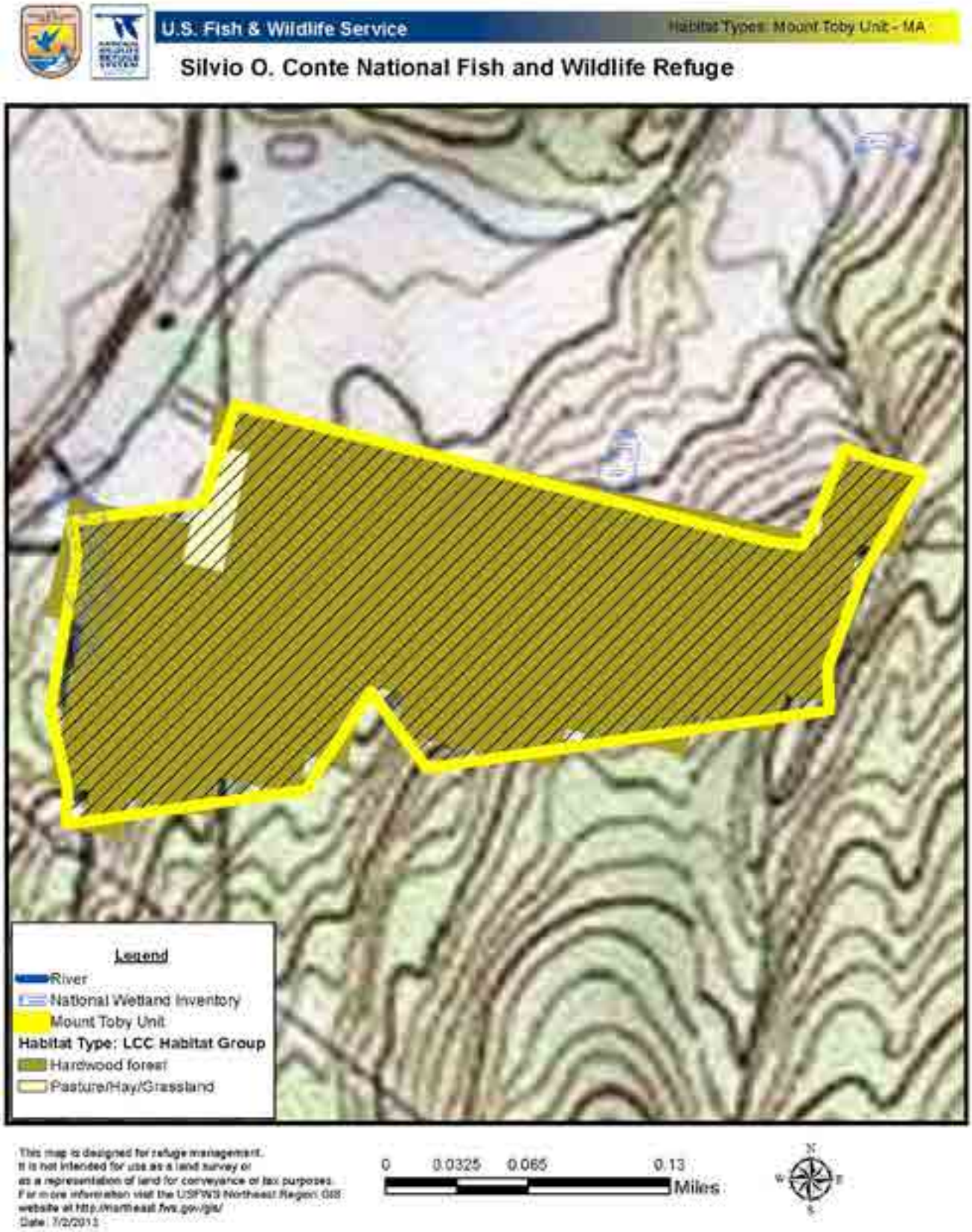


**Table A.27. Mount Toby – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 29 | 97.8% |
| *Forested uplands and wetlands subtotal* | *29* | *97.8%* |
| **Non-forested Uplands and Wetlands[2]** | | |
| Pasture/hay/grassland | 1 | 2.2% |
| *Non-forested uplands and wetlands subtotal* | *1* | *2.2%* |
| **TOTAL** | **30** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Mount Toby Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
The Mount Toby Unit's small size and isolation from other refuge units, has led us to aggregate our objectives and discussion under a single sub-objective that addresses the unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. While achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management, the Service also has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the Service has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines unit management that will benefit many species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Downed logs in a forest, streams and vernal pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a dead and downed logs, a vernal pool, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Mount Toby Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Fragmentation is of particular concern within the Mt Toby ecosystem—parcelization by land ownership is extensive. The large number and variety of landowners—each with their own objectives, resources, and constraints—means that the future of the Mount Toby landscape is far from certain. Our understanding of the current condition of all the habitats on refuge-owned lands and their contribution to the BIDEH of the unit and the broader landscape is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Massachusetts and the University of Massachusetts, in support of the State Wildlife Action Plan and the Mount Toby Demonstration Forest plan, to ensure management on Service lands complement adjacent land management objectives.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Monitor impacts to sensitive habitats from the introduction of trail users.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Mount Toby Unit as an outdoor classroom.

***Rationale:***
Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to "provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access."

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Mount Toby Unit as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Mount Toby Unit as an outdoor classroom.

***Rationale:***
Because this unit will be unstaffed, the majority of environmental education opportunities on this unit will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Mount Toby Unit as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Mount Toby Unit. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Mount Toby Unit will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Mount Toby Unit's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Mount Toby Unit.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Mount Toby Unit.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Mount Toby Unit would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Mount Toby Unit would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based state regulations.

***Rationale:***
The Mount Toby Unit is part of a partnership conservation effort with the University of Massachusetts, Massachusetts Department of Conservation and Recreation, The Nature Conservancy, and The Trustees of Reservations. Hunting is allowed on adjacent and nearby conservation lands and has been a popular area with hunters for many years. Popular game species include white-tailed deer, turkey, and cottontail rabbits. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal unit open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the unit and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the unit.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the unit with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Massachusetts Department of Fish and Game facilities, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*
- Work with Massachusetts Department of Fish and Game to encourage youth hunting at the unit as a means of introducing young people to this traditional recreation activity.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

*This objective is not applicable because there is no surface water on this unit.*

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Mount Toby Unit.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this part of the state. Currently, there is no infrastructure in place at this unit to support this use, and consequently, visitation for wildlife viewing and photography is limited. Allowing people to engage in wildlife observation and photography is in keeping with the other conservation landowners at Mount Toby.

**Management Strategies:**
*Within 1 year of CCP approval:*
- Allow wildlife observation and photography at the Mount Toby Unit.

- Allow public access at the Mount Toby Unit daily from 30 minutes before sunrise to 30 minutes after sunset, with the exceptions listed for hunters.

- Add information on the Mount Toby Unit to the refuge website.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
*Not applicable*

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Mount Toby Unit that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate, and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the unit. Each of these must be found to be both appropriate and compatible to be an authorized use of the refuge.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow dispersed hiking and snowshoeing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- If interest exists, work with partners to design and market a virtual geocache course at the unit. The course should integrate orienteering with refuge interpretive messages that include linking this unit to other refuge divisions and units.

# Overview
# Mount Tom Unit (Existing Refuge Unit)

## Holyoke, Massachusetts

| Total Unit Acres[1] | 141 |
|---|---|

[1]Actual acres

## What are the priority habitat types within the unit? What percentage of the total unit acreage do they represent?

- Hardwood forest - 85%
- Woodlands (natural) - 0.2%
- Pasture/Hay/Grassland – 12%
- Open water –3%

For more information on the habitats in the unit, see map A.37 and table A.28.

## What are the Federal trust and other natural resource values in the unit?

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). The Mount Tom Unit's hardwood forests provide stopover habitat for landbirds.

2. **Wetlands**
   A portion of the wetlands were inventoried by a contractor working for an adjacent landowner. Most wetlands are associated with drainages or the abandoned drainage system from the former ski resort.

## What habitat management activities would likely be a priority on the unit?

We will conduct a comprehensive, multi-scale wildlife habitat inventory. Baseline information on the condition of habitats (i.e., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on continuing to treat invasive plant populations to maintain native diversity.

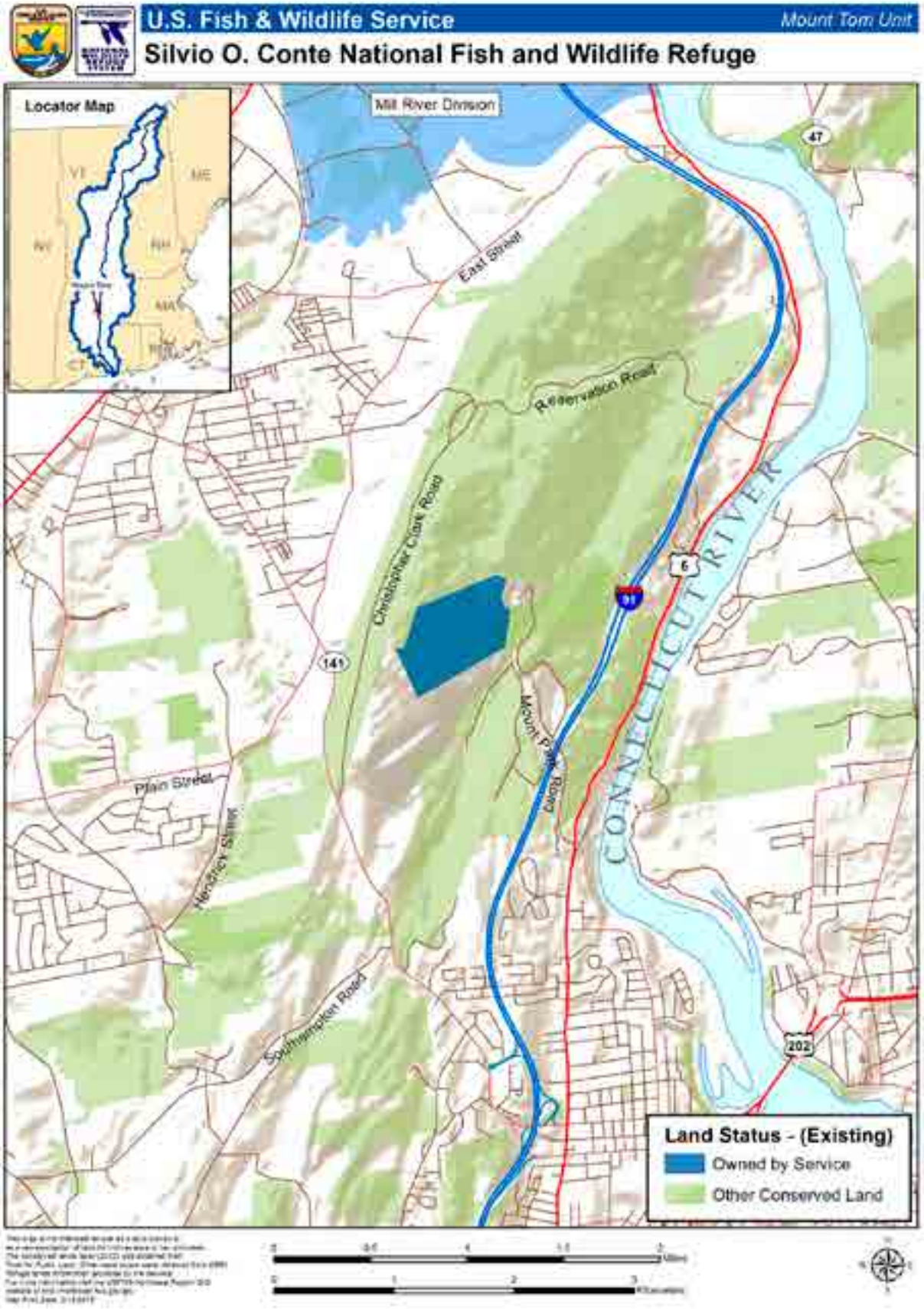
## What public use opportunities would likely be a priority on the unit?

The unit is currently closed to the public due to vandalism and safety concerns. Once it is safe to do so, we intend to open the property for wildlife observation, photography, interpretation, and environmental education.

## Does the unit have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

There are several State-listed plant and animal species on the unit. The Metacomet-Monandnock Trail passes just to the west of the unit.

*Map A.36. Mount Tom Unit – Location.*



*Map A.37. Mount Tom Unit – Habitat Types.*

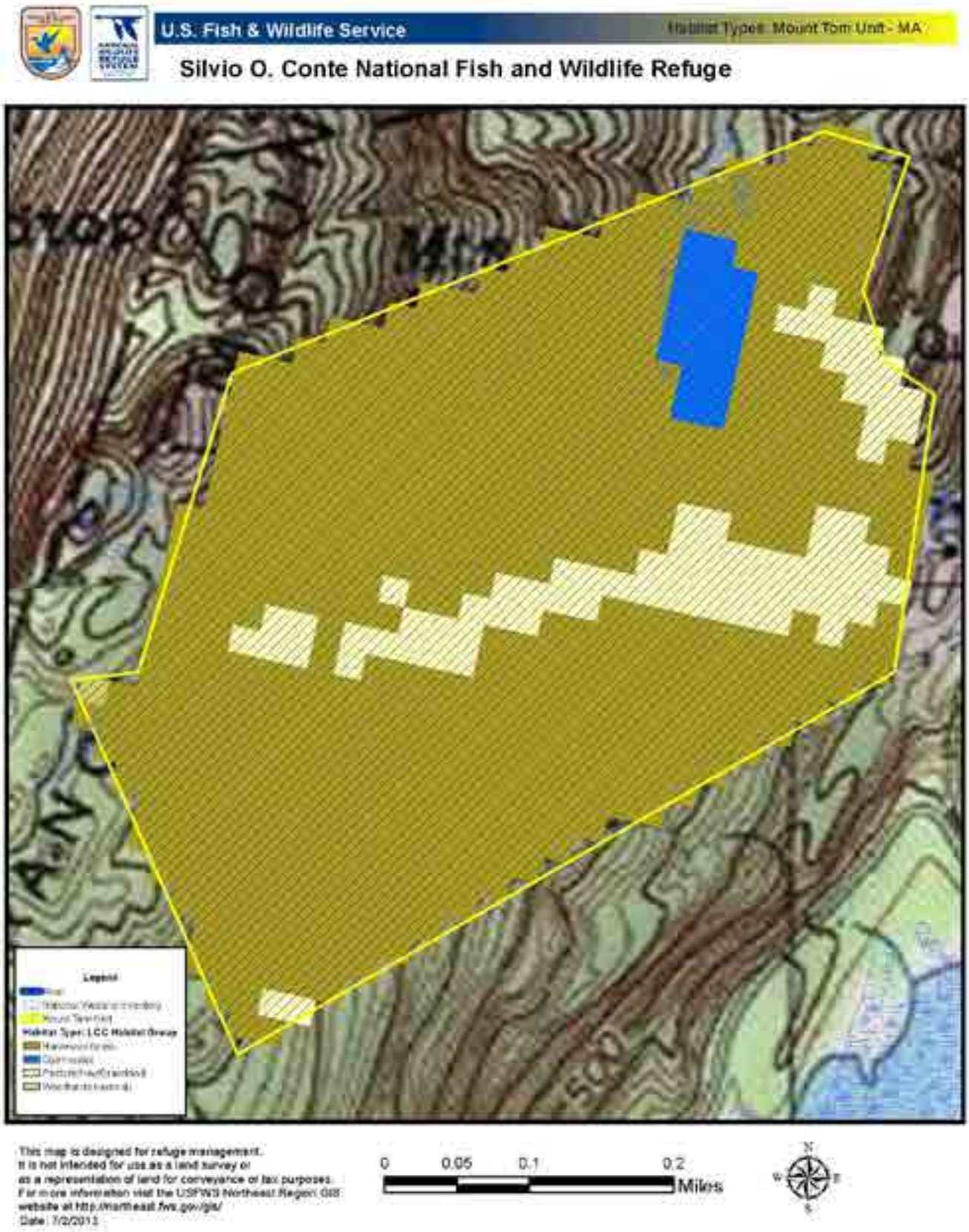


**Table A.28. Mount Tom Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 120 | 85.4% |
| Woodlands (natural) | 0.2 | 0.2% |
| *Forested uplands and wetlands subtotal* | *120* | *85.6%* |
| **Non-forested Uplands and Wetlands[2]** | | |
| Pasture/hay/grassland | 16 | 11.6% |
| *Non-forested uplands and wetlands subtotal* | *16* | *11.6%* |
| **Inland Aquatic Habitats[2]** | | |
| Open water | 4 | 2.9% |
| *Inland aquatic habitats subtotal* | *4* | *2.9%* |
| **TOTAL** | **140** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

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***Rationale:***
The Mount Tom Unit's small size and isolation from other refuge units, has led us to aggregate our objectives and discussion under a single sub-objective that addresses the unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. While achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management, the Service also has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987; Hunter 1991; Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines unit management that will benefit many species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Downed logs in a forest, a vernal pool, and a volcanic basalt ridge in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a dead and downed logs, a vernal pool, and a volcanic basalt ridge. BIDEH conservation overlaps with many aspects of matrix management and

ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Mount Tom Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. The unit's exposed volcanic basalt layers for instance, are anomalies in an otherwise forested landscape. They often have unique microclimates and special flora and fauna—dry, hot upper ridges that support oak savannas—often dominated by chestnut oak—and a variety of rare plant species. One could make the case that these habitats are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually, and more targeted strategies for those rare, threatened, or endangered species that may be at the northern or southern limit of their range. Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the unit is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Continue to control invasive plant species on the refuge, particularly where they threatened State-listed plant species. Priority invasive plant management actions include:
  - ✓ Continuing to collaborate with Mt. Tom Partners and Massachusetts Natural Heritage Program to strategically prevent and manage invasive species.
  - ✓ Preventing the establishment of garlic mustard on the unit, which is prevalent nearby.
  - ✓ Training volunteers to detect and report sightings of regionally significant new invaders, such as Japanese stiltgrass, mile-a-minute vine, and narrow leaf bittercress.
- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Monitor impacts to sensitive habitats from the introduction of trail users.
- Map natural communities; protect rare or exemplary examples.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
In coordination with the Massachusetts Department of Conservation and Recreation, the Holyoke Boys and Girls Club, The Trustees of Reservations, and the city of Holyoke, act as a resource to communities, school systems, public and non-profit organizations, and private educational organizations in Massachusetts, who want to use the Mount Tom Unit as an outdoor environmental education classroom.

***Rationale:***
The Mount Tom/Mount Holyoke Range is well known for an abundance of rare plants and animals and for the unique habitats associated with the uncommon trap rock formations. During the establishment of the Conte Refuge in 1995 this area was designated as one of 48 Special Focus Areas in the watershed that warranted protection through either conservation easements or acquisition. Thus, it has been recognized for many years as important land for wildlife conservation. In 2002, the Service acquired 140 acres of the mid and upper slopes of the former Mount Tom Ski Area. Simultaneously, the Massachusetts Department of Conservation and Recreation, The Trustees of Reservations, and the Holyoke Boys and Girls Club acquired other parts of the former resort. Public access has been restricted by all partners since acquisition because of the active rock quarry at the base of the mountain and the threat of vandalism to the former ski lodge buildings. The quarry ceased operations in 2012 and the Holyoke Boys and Girls Club is in the process of developing a site plan for their property which includes the former ski lodge. The intention of the partners is to open the property for compatible public uses, with an emphasis on environmental education and interpretation, particularly for adjacent cities such as Holyoke, once it is safe to do so.

The Mount Tom Unit is located in Holyoke, Massachusetts and has great potential to reach urban audiences who would not normally visit a refuge on their own. The old ski area is a partnership between four partners, The Trustees of Reservation, the Department of Conservation and Recreation, the Holyoke Boys and Girls Club, and the Service. The goal is to support the development of the old ski lodge into an environmental education facility for the Holyoke Boys and Girls Club. If this scenario happens, the facility could be an important means for the refuge to spread the refuge message to under-represented audiences through programs, displays, etc.

**Management Strategies:**
*Within 5 years of CCP approval and opening of the unit to public access:*

- Support the Holyoke Boys and Girls Club in the creation of an environmental education facility at the site of the old Mount Tom ski area lodge.
- Provide support for the formation of a Mount Tom Friends group.
- Promote the Mount Tom Unit as a destination for field trips and increase the number of students by two percent per year for the next 5 years.
- Work with Mount Tom partners and Friends group to develop experiential learning programs focusing on the ecology of Mount Tom and migratory birds that contribute to MA curriculum standards.
- Make environmental education training conducted in other parts of the refuge available to volunteers and Friends group members.
- Work with partners to use the Mount Tom Unit as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Promote other government agencies, non-profit organizations, private educational organizations, staff, volunteers, and members of the Friends of Mount Tom to offer high quality environmental education programs at the Mount Tom Unit.

***Rationale:***
See rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 5 years of CCP approval and opening of the unit to public access:*

- Develop a cadre of volunteers and partners that can lead educational visits by Holyoke Boys and Girls Club members, local schools, and other entities.
- Develop an educational partnership with the Holyoke Boys and Girls Club, Massachusetts Department of Conservation and Recreation, and The Trustees of Reservations to use the unit as an outdoor classroom emphasizing the unique ecological aspects of the unit.
- Encourage Mount Tom partners, volunteers, and members of Friends group to facilitate teachers and students at the Mount Tom Unit.
- Work with local environmental education providers to implement the refuge's Adopt-a-Habitat initiative to help individuals learn about and connect with their local environments;
- Work with Friends of Conte's Recreation and Education sub-committee to support and recruit partners that seek funding for watershed-based environmental education.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Encourage partners to develop an evaluation system to measure the effectiveness of environmental education programs.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
Encourage and support Mount Tom partners, and Friends group to work with communities, public and non-profit organizations, staff, and volunteers to offer quality interpretive programming at the Mount Tom Unit. Encourage development of highly trained interpreters by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. As mentioned above, the Mount Tom Unit is currently closed to the public. Once the Mount Tom Unit is opened to the public, we would develop an interpretive program. With various old roads, and trail connections to Trustees of Reservation and Department of Conservation and Recreation trails, the Mount Tom Unit is well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the habitats and cultural resources found on the Mount Tom property.

**Management Strategies:**
*Within 5 years of CCP approval and opening of the unit to public access:*

- Work with Mount Tom partners to employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, print and social media, signs, etc.) when creating programming for natural and cultural resource interpretation.
- Collaborate with Mount Tom partners, Friends group, and volunteers to create meaningful, consistent, thematic statements to be used in the delivery of programming at the Mount Tom Unit.
- Develop interpretive goals and objectives and identify appropriate strategies for refuge visitors.

- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval and opening of the unit to public access:*

- Collaborate with Mount Tom partners, Friends group, and volunteers to develop self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Mount Tom partners, Friends group and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval and opening of the unit to public access:*

- Through Mount Tom partners and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Mount Tom Unit.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.
- Work with partners to install an informational kiosk to disseminate information and interpretive resources.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media e.g. pamphlets, signs, etc.

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because Mount Tom is unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because Mount Tom is unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

*This objective is not applicable because the Mount Tom Unit is part of a partnership conservation effort with the Massachusetts Department of Conservation and Recreation, The Trustees of Reservations, and the Holyoke Boys and Girls Club. None of the adjacent landowners allow hunting on their property. Holyoke Boys and Girls Club is in the process of developing a site plan to construct new youth facilities to replace the old ski lodge and ancillary facilities. Once that is complete, children will be onsite, frequently engaged in outdoor activities. The Mount Tom Unit is upslope from the Holyoke Boys and Girls Club property and does not have separate access or Service-owned parking. Hunting on this unit is not being proposed because it was not previously allowed, adjacent landowners do not intend to allow hunting in the future, and children may be on the unit any time of the year.*

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

*This objective is not applicable. The only water body suitable for fishing on the unit is Mountain Park Reservoir, a 1.5-acre, constructed pond that was used for snowmaking by the former ski area. It is located about mid-slope and is only accessible to the public by foot. Runoff and possibly springs feed the pond. Angling could only be sustained with a put-and-take fishery, but this is not economical, nor is it warranted because there are other places to fish in the area.*

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Mount Tom Unit.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this part of the state. As mentioned above, the Mount Tom Unit is currently closed to the public. Also, there is currently no infrastructure in place at this unit to support this use, and consequently, visitation for wildlife viewing and photography is limited. Once the unit is opened to the public we would offer opportunities for wildlife observation and photography.

**Management Strategies:**
*Within 1 year of CCP approval and opening of the unit to public access:*

- Allow wildlife observation and photography at the Mount Tom Unit.
- Allow public access at the unit daily from 30 minutes before sunrise to 30 minutes after sunset.
- Add information on the unit to the refuge website.
- Work with partners to install an informational kiosk in a conspicuous location to post information and notices to visitors.

*Within 5 years of CCP approval and opening of the unit to public access:*

- Work within the Mount Tom Partnership (i.e. Massachusetts Department of Conservation and Recreation, The Trustees of Reservations, and Holyoke Boys and Girls Club to develop a public access strategy that responds to the demand for access across all ownerships, provides safe trailhead parking, informational kiosk(s), etc.

*Within 10 years of CCP approval and opening of the unit to public access:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the unit.

***Rationale:***
Once the unit is opened to the public, the entire unit would be available for wildlife observation and photography. However, there are other steps the refuge can take to enhance visitor's experiences on the unit. Visitation increases are expected as this unit becomes better known because it is in close proximity to Holyoke and Easthampton, Massachusetts. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval and opening of the unit to public access:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a Special Use Permit.

*Within 5 years of CCP approval and opening of the unit to public access:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups and environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the unit for distribution at informational kiosks, the refuge website, and other popular media.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Mount Tom Unit that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking and wildlife observation. Examples include the New England Trail, located adjacent to the unit along the Mount Tom ridgeline which is owned and managed by the Massachusetts Department of Conservation and Recreation.

*Within 5 years of CCP approval and opening of the unit to public access:*

- Once the unit is open to the public, work with partners to determine how best to connect with users on the New England Trail.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Mount Tom Unit that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the unit without detrimentally impacting the wildlife resource. Once the unit is opened to the public, we would allow hiking, snowshoeing, pet walking, and recreational gathering of antler sheds, fruits, plant parts, and mushrooms for personal use.

**Management Strategies:**
*Within 1 year of CCP approval and opening of the unit to public access:*

- Allow dispersed hiking and snowshoeing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of the priority public uses by special use permit.

*Within 5 years of CCP approval and opening of the unit to public access:*

- Work with partners to determine whether a virtual geocache course at the unit is acceptable on the conserved property. The course should integrate orienteering with refuge interpretive messages that include linking this unit to other refuge divisions and units.

# Overview
# Third Island Unit (Existing Refuge Unit)

## Deerfield, Massachusetts

| Total Unit Acres[1] | 4 |
|---|---|

[1]Actual acres

## What are the priority habitat types within the unit? What percentage of the total unit acreage do they represent?

- Hardwood forest - 66%
- High-energy riverbank – 33%

For more information on this unit's habitats, see map A.39 and table A.29.

## What are the Federal trust and other natural resource values in the unit?

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). Third Island sits third in a line of four islands within the Connecticut River, and its 2 acres of hardwood forest provide stopover habitat for landbirds, and supracanopy trees for nesting bald eagles.

2. **Other**
   Third Island is part of series of four islands in the Connecticut River. These islands are biologically interesting because of their unique physical environments, habitats, and vegetation. The alluvial deposition of cobbles, sand and silt during high spring flood events created the islands, and annual flooding across the islands have created a gradient of substrate types and therefore unique habitats and vegetation.

   Each island, including Third Island, typically has two vegetation communities: a high-energy riverbank community on the upstream end and floodplain forest on the downstream end. The Massachusetts Natural Heritage and Endangered Species Program designate both community types as priority natural communities due to their rarity in the State. High-energy riverbank communities are rare because they can only form in steep-gradient, high flood areas, and several state-listed herbaceous species occur. Floodplain forests were at one time quite common in the state, particularly on the extensive alluvial silt deposits of the Connecticut River Valley, but they have been largely converted to agricultural land due to their high fertility (Paveglio and Taylor 2010; UMass 2012).

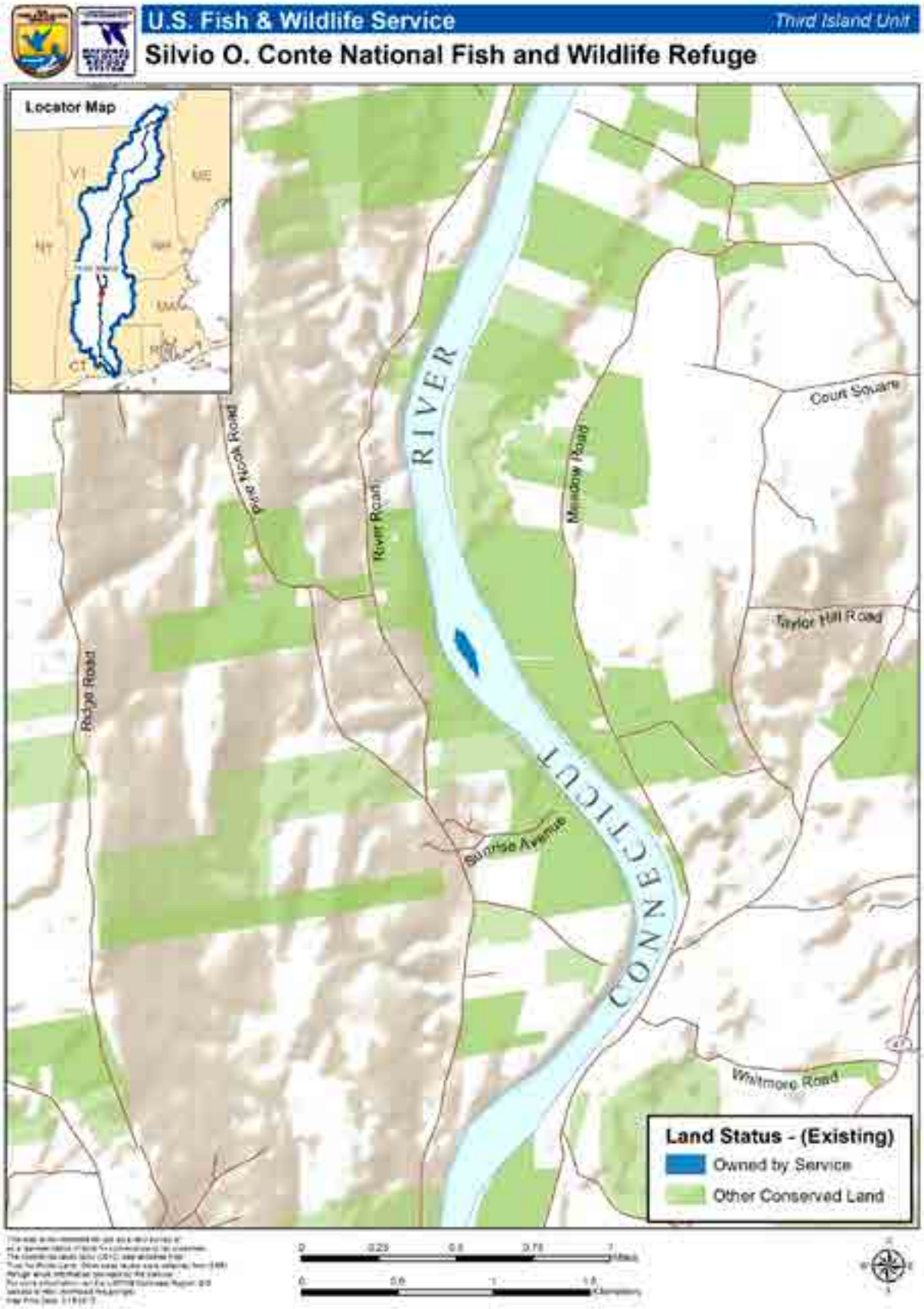
## What habitat management activities would likely be a priority on the unit?

We will conduct a comprehensive, multi-scale wildlife habitat inventory. Baseline information on the condition of habitats (ie. forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on managing invasive plants to maintain native diversity.

## What public use opportunities would likely be a priority on the unit?

We allow public access to Third Island from August 1 through December 31. The island is closed the remainder of the year to protect nesting bald eagles. Our priority would be to offer the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

*Map A.38. Third Island Unit – Location.*



*Map A.39. Third Island Unit – Habitat Types.*

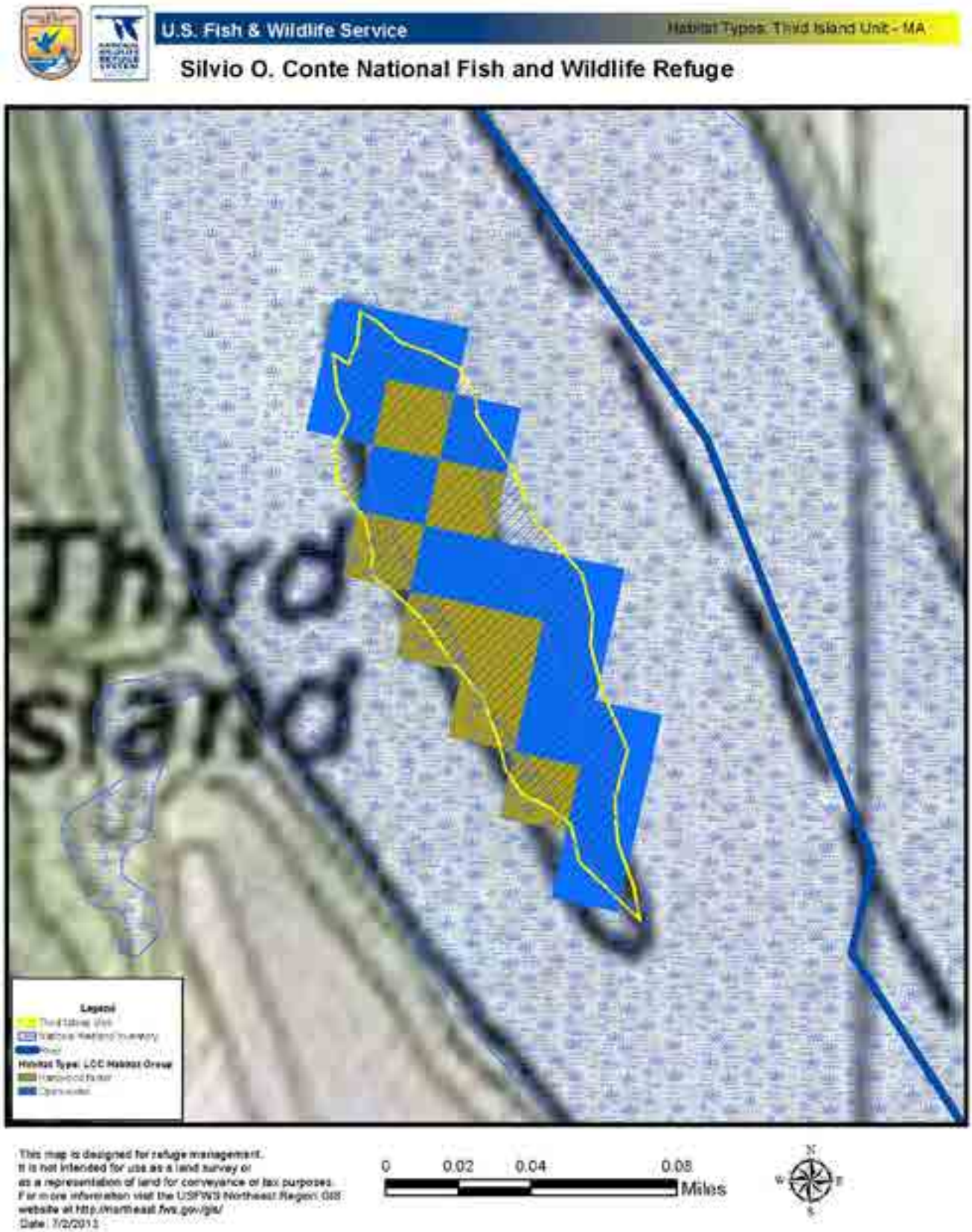


**Table A.29. Third Island Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 2 | 35.0% |
| *Forested uplands and wetlands subtotal* | *2* | *35.0%* |
| **Inland Aquatic Habitats[2]** | | |
| Open water | 3 | 65.0% |
| *Inland aquatic habitats subtotal* | *3* | *65.0%* |
| **TOTAL** | **5** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Third Island Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
The Third Island Unit's small size and isolation from other refuge units, has led us to group our objectives and discussion under a single sub-objective that addresses the unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. While achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management, the Service also has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines unit management that will benefit many species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Downed logs in a forest, a vernal pool, and a rocky outcrop in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a dead and downed logs, a vernal pool, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Third Island Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats, by virtue of the unit being an island, represent small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and provide additional structural and species diversity to the matrix. The island's high-energy cobble riverbank community or its downstream floodplain forests, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—rare grasses that thrive on frequently disturbed sites, or understory herbaceous plants restricted to nutrient rich sites. One could make the case that these habitats are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually, and more targeted strategies for those rare, threatened, or endangered species like the several State-listed dragonfly species that utilize the island's cobble shore and coarse woody debris. Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the unit is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible. Management priority should be given to invasive species, such as bittersweet, that threaten supra-canopy trees used by nesting bald eagles.

- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Goal 2: Education, Interpretation, and Outreach: Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Third Island Unit as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge

System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Third Island Unit as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**

- Encourage schools, scout groups, and summer camps to use the Third Island Unit as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Third Island Unit as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Third Island Unit. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. During the period the island is open to the public Third Island Unit is well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Third Island Unit's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Third Island Unit.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through partners, and Friends group, annually provide quality interpretive programs,
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Third Island Unit would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Third Island Unit would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based state regulations.

***Rationale:***
The Third Island Unit is a 3.8-acre island in the Connecticut River in Deerfield, MA. The island is a popular stop for canoeists and kayakers and has been home to nesting bald eagles for several years. Other similar islands in the vicinity such as Second Island, administered by Massachusetts Department of Conservation and Recreation, are open to hunting. In reality, hunting at these small islands is primarily for waterfowl and often from boats as there is no other access. Hunting seasons can be designed so that bald eagle nesting is not affected.

As mentioned above, we allow public access to Third Island from August 1 through December 31. The island is closed the remainder of the year to protect nesting bald eagles.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Massachusetts Department of Fish and Game to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
*Not applicable*

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide the opportunity for a quality fishing experience generally following state regulations.

***Rationale:***
Fishing opportunities at Third Island are limited to bank fishing in the Connecticut River. This island is a popular resting area for canoeists and kayakers paddling down the river. By allowing fishing, visitors could enjoy this priority public use while visiting the island.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- The Third Island Unit would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations, except from January 1 to July 31 each year when the island will be closed to protect nesting bald eagles.

**Inventory and Monitoring Strategies:**
*Within 10 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
There are limited means of connecting with anglers on this unit because the island is remote and only accessible via boat, canoe, or kayak. The best way to inform visitors will be indirect methods such as the refuge website, social media, and by posting information on the island.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Third Island Unit.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity for people recreating in this reach of the Connecticut River. During the summer and fall water levels are relatively shallow, limiting access mainly to non-motorized watercraft. These people generally are out to experience the natural river attributes and enjoy viewing and photographing wildlife and their habitats. The Third Island Unit has been closed to all public uses during the bald eagle nest season which extends approximately from January 1 through June, although this may vary.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow public access at the Third Island Unit daily from 30 minutes before sunrise to 30 minutes after sunset, except from January 1 to July 31 each year when the island will be closed.

*Within 5 years of CCP approval:*

- Construct a kiosk to post information on wildlife, fish, plants, and river dynamics.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the division.

***Rationale:***
The entire unit would be available for wildlife observation and photography; however, since this is a small island with limited access no viewing aids would be developed.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Produce a wildlife and plant species guide for the Third Island Unit that will be available on the refuge website and at the refuge headquarters.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Third Island Unit that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway trail. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

*Within 5 years of CCP approval:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway trail.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Third Island Unit that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

*Within 1 year of CCP approval:*

- Allow dispersed hiking.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

# Overview
# Wissatinnewag Unit (Existing Refuge Unit)

## Greenfield, Massachusetts

| Total Unit Acres[1] | 21 |
|---|---|

[1]Actual acres

## Summary

### What are the priority habitat types within the proposed unit?

- Hardwood forest - 48%
- Woodlands (natural) – 34%

For more information on the unit's habitats, see map A.41 and table A.30.

### What are the Federal trust and other natural resource values in the unit?

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) receives higher use by migrants, with use concentrated in habitats along the Connecticut River main stem (Smith College 2006). Though, small in acreage, the Wissatinnewag Unit's hardwood forests provide stopover habitat for landbirds.

### What habitat management activities would likely be a priority on refuge lands in the unit

Conduct an inventory to collect baseline information on the condition of habitats and wildlife to inform more detailed, habitat prescriptions within a required step-down HMP. Once inventory has been completed, then management will focus on managing invasive plants to maintain native diversity.

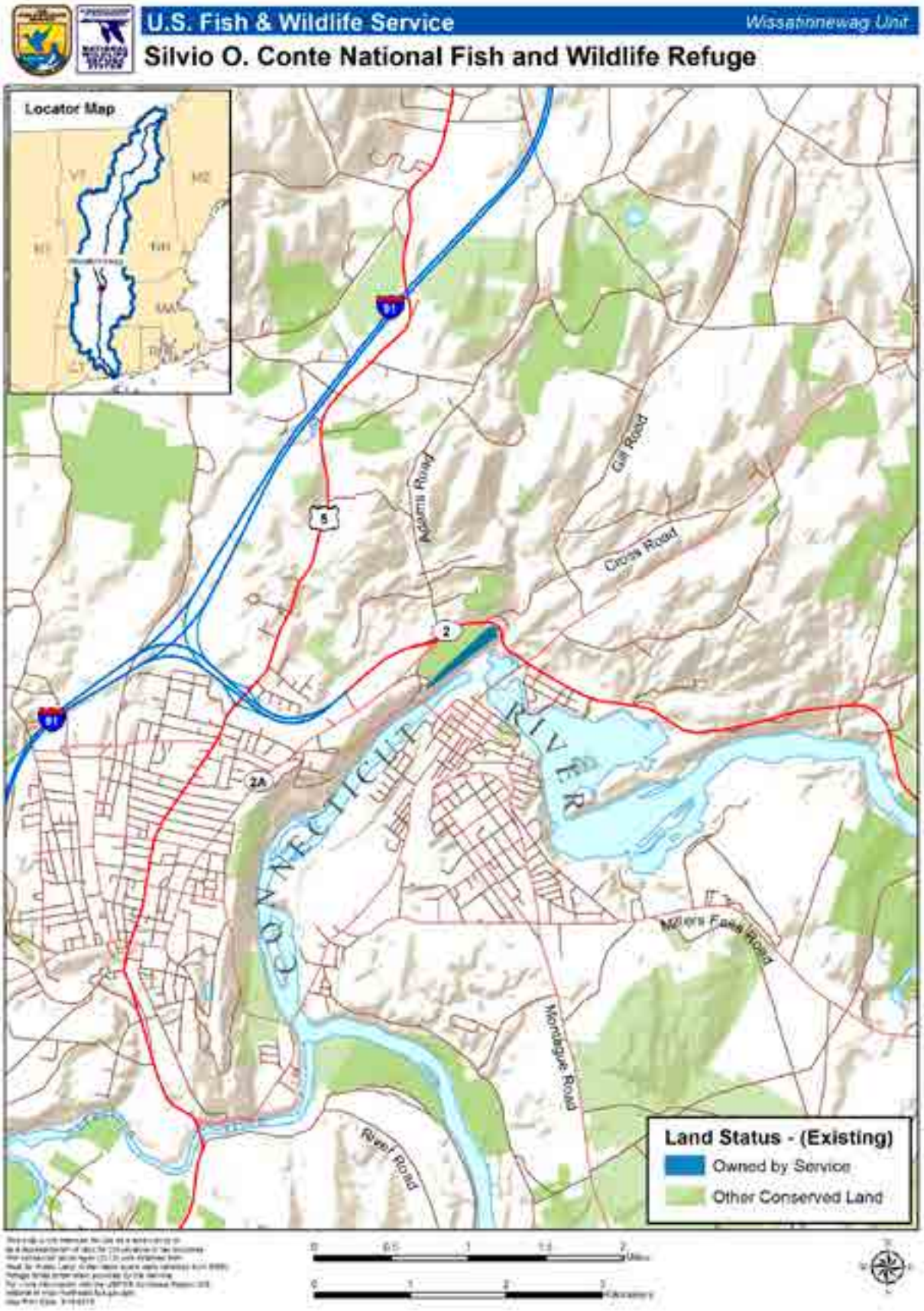
### What public use opportunities would likely be a priority on the unit?

The unit is closed to the public to protect resources.

### Does the unit have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

The Wissatinnewag Unit contains portions of the extensive, complex Mackin Sand Bank Site, which has produced burials and evidence of Native American settlement starting at least by the Middle Archaic period, more than 7,000 years ago.

*Map A.40. Wissatinnewag Unit – Location.*



*Map A.41. Wissatinnewag Unit – Habitat Types.*

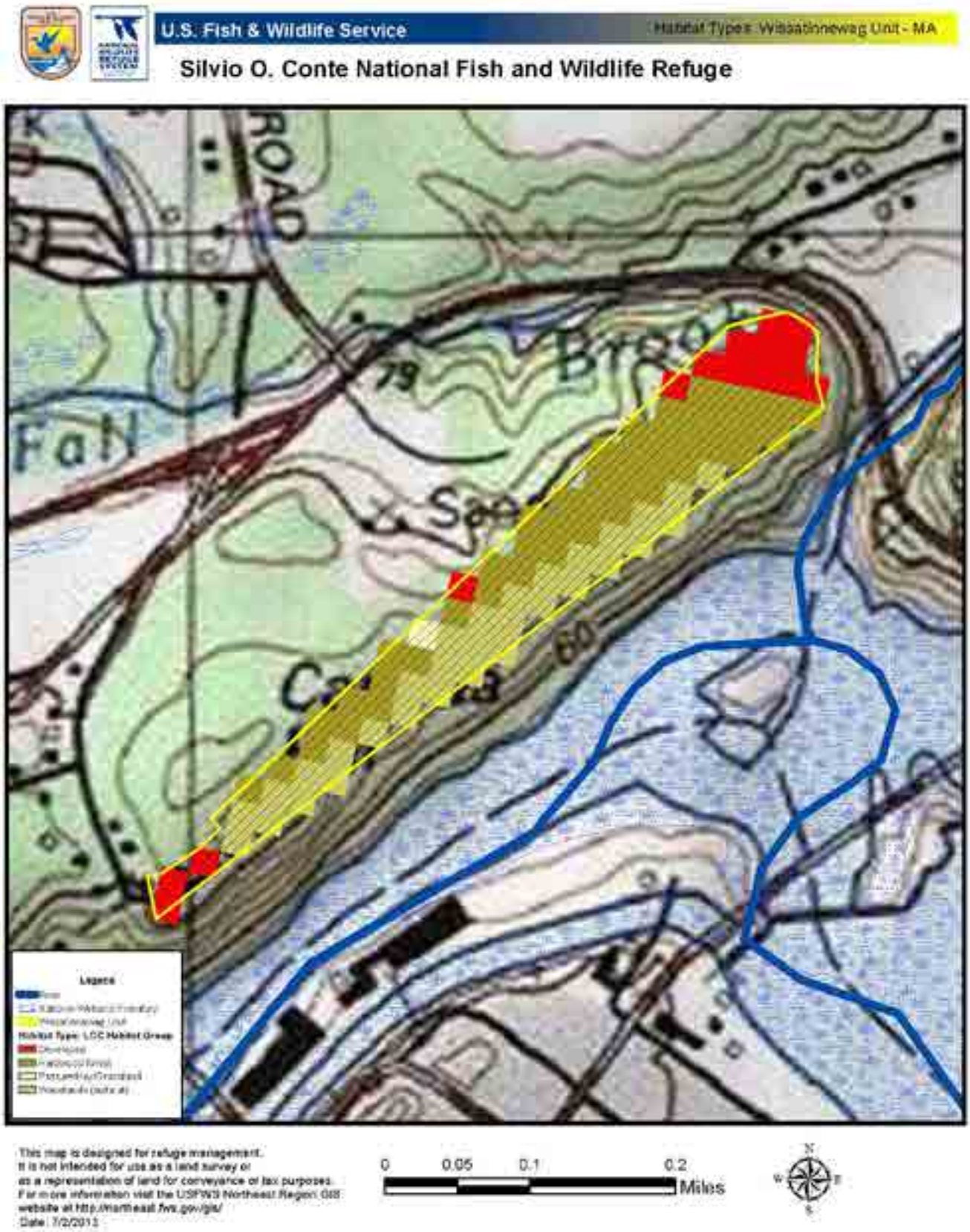


**Table A.30. Wissatinnewag Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 10 | 48.4% |
| Woodlands (natural) | 7 | 34.1% |
| *Forested uplands and wetlands subtotal* | *17* | *82.4%* |
| **Non-forested Uplands and Wetlands[2]** | | |
| Pasture/hay/grassland | 0.2 | 1.1% |
| *Non-forested uplands and wetlands subtotal* | *0.2* | *1.1%* |
| **Other** | | |
| Developed | 3 | 16.5% |
| *Other subtotal* | *3* | *16.5%* |
| **TOTAL** | **20** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Wissatinnewag Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
The Wissatinnewag Unit's small size and isolation from other refuge units, has led us to group our objectives and discussion under a single sub-objective that addresses the unit's contribution to the biological integrity, biological diversity, and environmental health of the wider Connecticut River watershed. While achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management, the Service also has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the Service has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines unit management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would

predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Wissatinnewag Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats, by virtue of refuge ownership patterns, are small, isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the unit is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State of Massachusetts, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

*This goal is not applicable to the Wissatinnewag Unit because the unit is closed to all public access, except by special use permit, to protect sensitive resources.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

*This goal is not applicable to the Wissatinnewag Unit because the unit is closed to all public access, except by special use permit, to protect sensitive resources.*

Dave Govatski

*Cherry Pond from the Pondicherry Division, New Hampshire*

# State of New Hampshire

- **Ashuelot River Conservation Focus Area (Proposed)**
- **Blueberry Swamp Conservation Focus Area (Existing Refuge Division)**
- **Mascoma River Conservation Focus Area (Proposed)**
- **Pondicherry Conservation Focus Area (Existing Refuge Division)**
- **Sprague Brook Conservation Focus Area (Proposed)**

# Overview
# Ashuelot River Conservation Focus Area (Proposed)

## Alstead, Marlow, Surry, and Gilsum, New Hampshire

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 17,753 | 84.2% |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *17,753* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 3,332 | 15.8% |
| Total Acres in CFA[2, 4] | 21,085 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS. [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The proposed Ashuelot CFA is part of a larger area identified as a high priority for conservation for the State of New Hampshire because it contains a large intact forested area with small, scattered, high-quality forested wetlands that are valuable, especially for black duck nesting. The CFA also encompasses a tremendous diversity of topography (e.g., elevation and aspects). Service land acquisition in this CFA could serve as a footing between other nearby conserved areas.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 85.7%
- Shrub swamp and Floodplain Forest – 2.3%
- Freshwater Marsh – 1.3%

For more information on habitats in the CFA, see map A.43 and table A.31.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.32 below, there are ten priority refuge resources of concern (PRRC) terrestrial and aquatic species, including a federal listed species that rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) including wetland dependent and forest interior species. These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   The Ashuelot River, below Surry Mountain Lake, supports the federally endangered dwarf wedgemussel. This species requires stable bank conditions and good water quality (U.S. Fish and Wildlife Service 1993, Nedeau et al. 2000).The Ashuelot River is one of two rivers in the upper watershed where significant numbers of mussels have been found. Habitat loss, fragmentation and altered river processes are threats impeding the recovery of dwarf wedge mussel in the upper Connecticut River (Nedeau 2009).

American eel, a species petitioned for Federal listing also occurs in the Ashuelot CFA. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit the CFA streams, lakes, and ponds. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000).

2. **Migratory Birds**
The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Ashuelot CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat for a diversity bird species.

The New Hampshire Chapter of The Nature Conservancy (TNC) identified the Surry Mountain area as one of 13 high priority habitat areas in the Ashuelot River watershed. These areas were identified due to their ecological diversity and unfragmented landscape (Zankel 2004). To better understand the biological diversity within the Surry Mountain area, TNC initiated the collection of baseline bird and habitat data. The intact forest and wetland ecosystems provide habitat for a diversity of bird species from aquatic and wetland-dependent birds to those that use large, unfragmented forests.

A total of 68 documented bird species use the habitats identified in the Ashuelot CFA. These include PRRC species such as blackburnian warbler, Canada warbler, chestnut-sided warbler, wood thrush, bald eagle, and American woodcock. Wood thrush and blackburnian warbler prefer older forests, while American woodcock and chestnut-sided warbler rely on young forests within the CFA. Canada warbler prefers the moist soils and structural diversity of forested wetlands and riparian areas. SGCN species were also observed during surveys including common loon, American bittern, great blue heron, Virginia rail, veery, and eastern towhee.

3. **Waterfowl**
Wetlands within the CFA, especially those associated with Surry Mountain Lake, provide habitat for breeding and migrating species such as blue-winged teal, hooded merganser, common merganser, and wood duck. These wetlands may also provide provide quality breeding, foraging, and stopover habitat for American black duck, a species of high conservation concern and PRRC.

4. **Diadromous fish and other aquatic species**
The Ashuelot River CFA supports numerous pond, wetland and river habitats. A portion of the Ashuelot River (from Village Pond to Surry Mountain Lake) meanders through the hilly terrain of the CFA. The main stem and tributaries provide habitat for American eel, and possibly Eastern brook trout. Both species are PRRC, though a species inventory will be necessary to confirm brook trout presence.

Surry Mountain Lake is located in the southern portion of the CFA. This manmade lake is associated with the Surry Mountain Dam, which was built on the Ashuelot River in 1941 by the U.S. Army Corps of Engineers to prevent flooding along the Connecticut River. This 265-acre lake is managed by New Hampshire Fish and Game Department and the Army Corps of Engineers, and supports various species of bass, crappie, walleye, and lake trout.

5. **Wetlands**
Over six percent of the Ashuelot CFA is wetland habitat with a high percent of these acres forested wetlands. A large wetland complex occurs on the north end of Surry Mountain Lake. This complex contains a mix of shrub swamps and floodplain forest, hardwood swamp and freshwater marsh. According to The Nature Conservancy, the floodplain forest that occurs in this CFA is the only significant floodplain in NH that is dominated by white swamp oak. This species is rare in NH, making this habitat ecologically important (Marks et al 2011). Other wetland habitats in patches of variable size are scattered throughout the CFA.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and native species will dominate. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- We will also conduct habitat management in wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers, ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

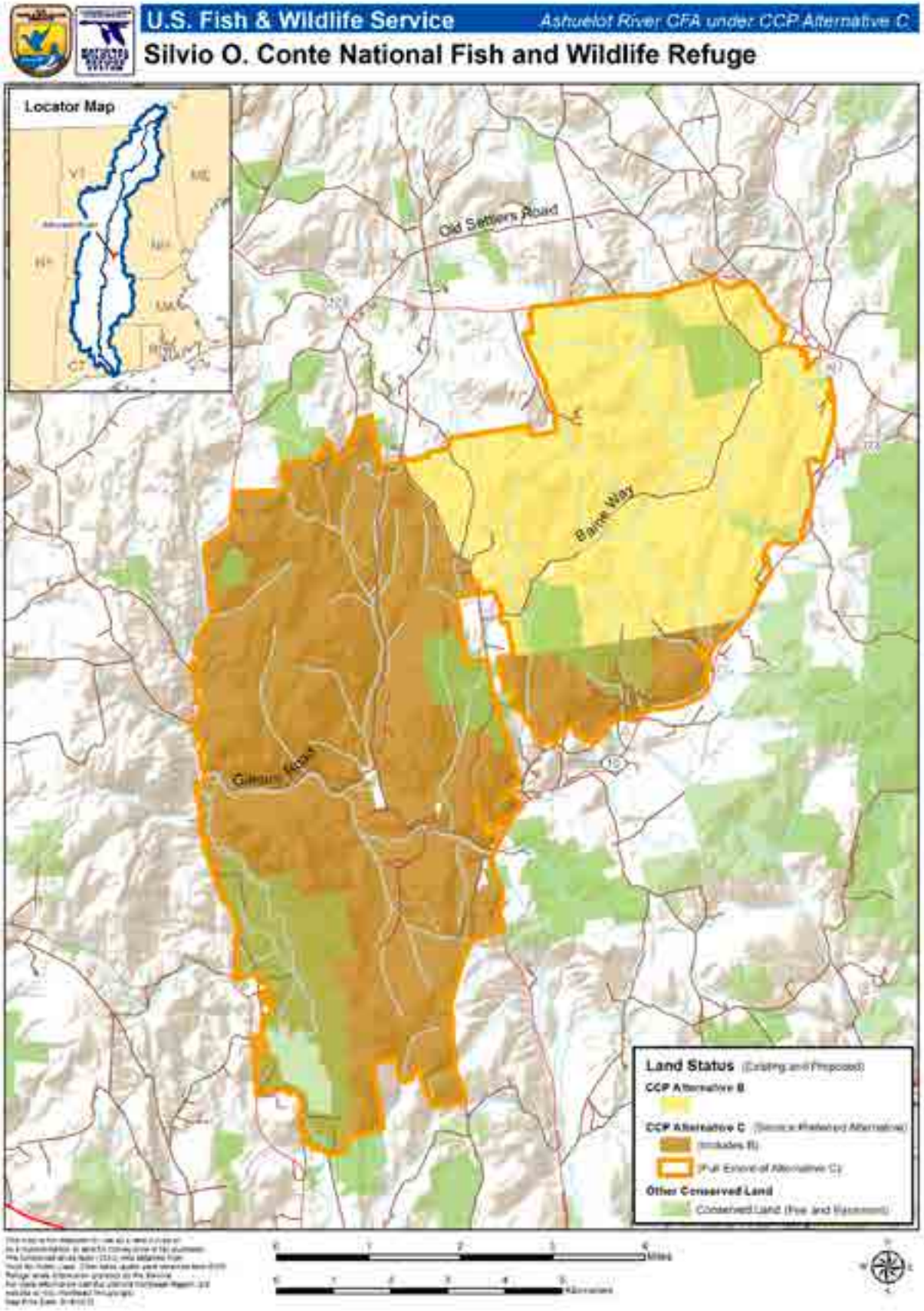
## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

## Does the proposed CFA have special ecological, cultural, or recreational features or designations of regional, State, or local importance?

Surry Mountain Area was also identified by The New Hampshire Chapter of TNC as one of 13 high priority habitat areas in the Ashuelot watershed due to its ecological diversity and unfragmented landscape.

*Map A.42. Ashuelot CFA – Location.*



*Map A.43. Ashuelot CPA/CFA – Habitat Types.*

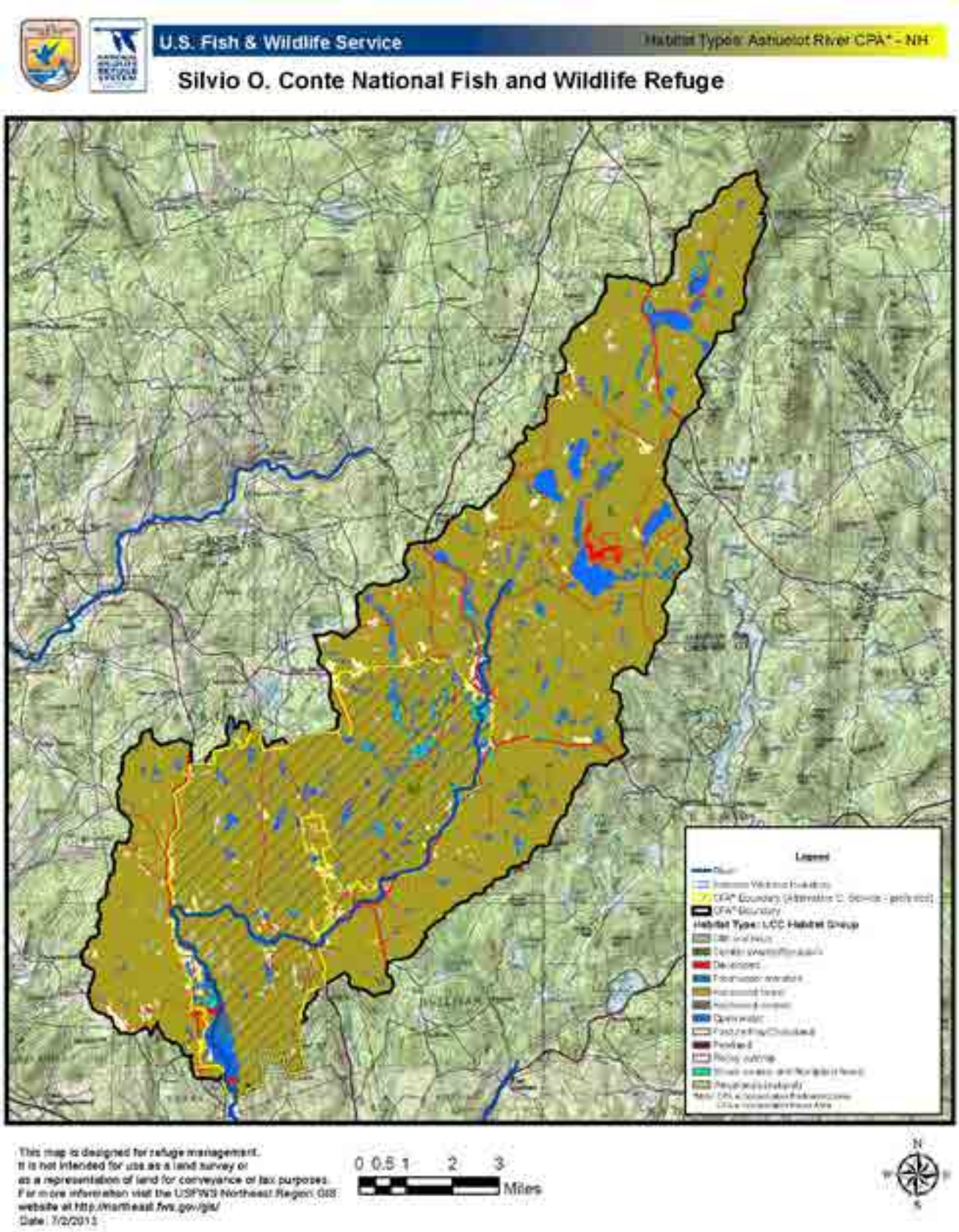


**Table A.31. Ashuelot CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 914 | 1.4% | 290 | 36 | 0 | 1.4% | 31.7% |
| Hardwood forest | 56,773 | 86.0% | 18,396 | 2,275 | 0 | 85.7% | 32.4% |
| Hardwood swamp | 308 | 0.5% | 266 | 201 | 0 | 1.2% | 86.3% |
| Shrub swamp and floodplain forest | 919 | 1.4% | 498 | 128 | 0 | 2.3% | 54.2% |
| Woodlands (natural) | 193 | 0.3% | 126 | 12 | 0 | 0.6% | 65.1% |
| *Forested uplands and wetlands subtotal* | *59,108* | *89.6%* | *19576* | *2,653* | *0* | *91.1%* | *33.1%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 257 | 0.4% | 131 | 49 | 0 | 0.6% | 51.1% |
| Freshwater marshes | 637 | 1.0% | 282 | 137 | 0 | 1.3% | 44.3% |
| Pasture/hay/grassland | 1,625 | 2.5% | 511 | 130 | 0 | 2.4% | 31.5% |
| Peatland | 60 | 0.1% | 16 | 0 | 0 | 0.1% | 27.0% |
| Rocky outcrop | 439 | 0.7% | 90 | 0 | 0 | 0.4% | 20.5% |
| *Non-forested uplands and wetlands subtotal* | *3,017* | *4.6%* | *1,030* | *317* | *0* | *4.8%* | *34.2%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1,818 | 2.8% | 462 | 250 | 0 | 2.2% | 25.4% |
| *Inland aquatic habitats subtotal* | *1,818* | *2.8%* | *462* | *250* | *0* | *2.2%* | *25.4%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Other** | | | | | | | |
| Developed | 2,045 | 3.1% | 408 | 107 | 0 | 1.9% | 20.0% |
| *Other subtotal* | *2,045* | *3.1%* | *408* | *107* | *0* | *1.9%* | *20.0%* |
| **TOTAL** | **65,987** | **100.0%** | **21,476** | **3,326** | **0** | **100.0%** | **32.5%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.32. Ashuelot CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 18,396 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Red-shouldered Hawk[I,J]<br>Bobcat[I]<br>**Ovenbird**[A]<br>Eastern Wood Pewee[A,J]<br>Northern Flicker[A,J]<br>Yellow-bellied Sapsucker[A]<br>Rose-breasted Grosbeak[A]<br>**Eastern Red Bat**[I]<br>**Louisiana Waterthrush**<br>American Redstart[A,J]<br>Veery[A]<br>Black-throated Green Warbler[A]<br>Black-throated Blue Warbler[A]<br>Black-and-white Warbler[J]<br>Black-billed Cuckoo[A,J]<br>Broad-winged hawk[J]<br>Eastern Whip-poor-will[J]<br>Great-crested Flycatcher[J]<br>Northern Goshawk[A,I,J]<br>Scarlet Tanager[J]<br>Northern Parula[A]<br>Ruffed Grouse[A]<br>Black Racer[I] |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3 acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Chestnut-sided Warbler**[A, B, I] | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Bald Eagle[C, G] | Breeding and migrating habitat includes large bodies of open water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf et al. 2001). | |
| Blackburnian Warbler[A, B] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Swamp[5] - 266 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | **Northern Waterthrush**<br>Red-shouldered Hawk[J]<br>Rose-breasted Grosbeak[J]<br>Purple Finch[A,I]<br>Veery[A,J]<br>White-eyed Vireo[J]<br>Northern Parula[A]<br>Wood Duck[J] |
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp[5] - 290 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | Red-shouldered Hawk[J]<br>Rose-breasted Grosbeak[J]<br>Purple Finch[A,I]<br>Veery[A,J]<br>White-eyed Vireo[J]<br>Northern Parula[A]<br>Wood Duck[J] |
| **Shrub Swamp and Floodplain Forest[5] - 498 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | **Warbling Vireo**<br>**Willow Flycatcher**<br>Veery[A]<br>Ruffed Grouse[A]<br>Chestnut-sided Warbler[A]<br>American Redstart[A]<br>Canada Goose[J]<br>Mallard[J]<br>Wood Duck[J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>**Wood Turtle[I]** |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Forested Uplands and Wetlands[4]** | | |
| **Woodlands (natural)[5] - 126 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] - 131 acres** | | |
| Laurentian-Acadian acidic cliff and talus[H]<br><br>North-central Appalachian acidic cliff and talus[H]<br><br>North-central Appalachian circumneutral cliff and talus[H]<br>Laurentian-Acadian calcareous cliff and talus[H] | These cliff systems occur at low to mid elevations, well below treeline. The vegetation within the *Laurentian-Acadian acidic cliff and talus system* is patchy and often sparse, punctuated with patches of small trees such as birches and spruce species. Species that prefer calcium rich soils are absent. In north-facing or other sheltered settings where cold air accumulates at the bottom of slopes, a shrubland of heaths and reindeer lichens can develop. The *North Central Appalachian acidic cliff and talus system* comprises sparsely vegetated to partially wooded cliffs. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be comparatively well-developed and different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. Eastern red cedar is a characteristic tree species, poison ivy a characteristic woody vine, and common polypody a characteristic fern. Substrates within the *circumneutral cliff and talus system* include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood, and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern. *The calcareous cliff and talus system* has more nutrient rich soils, and the the vegetation is often sparse, but may include patches of small trees including northern white cedar, which may be the dominate species. Ash species and basswood are woody indicators of the enriched setting (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 282 acres** | | |
| **American Black Duck**[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **American Bittern**[A,I]<br>**Marsh Wren**<br>**Virginia Rail**[I]<br>Great Blue Heron[I]<br>Wood Duck[A,J]<br>Canada Goose[J]<br>Common Loon[A,I]<br>Mallard[J]<br>Wood Turtle[I] |
| **Pasture/Hay/Grassland [5] – 511 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[J]<br>Chestnut-sided Warbler[A,I]<br>**Bobolink**[A]<br>**Grasshopper Sparrow**[I]<br>**Eastern Meadowlark**[I] |
| **Peatland [5] – 16 acres** | | |
| Boreal-Laurentian-Acadian acidic basin fen[H] | These fens have developed in open or closed relatively shallow basins with nutrient-poor and acidic conditions. The substrate is sphagnum, and vegetation typically includes areas of dominance by grasses and dwarf-shrubs. Leatherleaf is usually present, and scattered stunted trees may occur. These fens often develop adjacent to open water (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Rocky Outcrop[5] – 90 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | The Northern Appalachian-Acadian rocky heath outcrop system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Low-bush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 462 acres** | | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | Wood Turtle[I]<br>**Slimy Sculpin[I]**<br>Tessellated Darter[I] |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | |
| **Dwarf Wedge-mussel[B, D, F]** | Inhabits creeks and small rivers, prefers the stable bank conditions afforded by gravel or sandy substrates, and good water quality (Nedeau et al. 2000, USFWS 1993). | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Canada Goose[A]<br>Wood Duck[A]<br>Hooded Merganser[J]<br>Green-winged Teal[J]<br>Mallard[J]<br>Bald Eagle[A,I]<br>Great Blue Heron[I]<br>**Common Merganser**<br>**Ring-necked Duck**<br>**Common Loon[A,I]** |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2006 New Hampshire Wildlife Action Plan (Species of Greatest Concern)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Ashuelot CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, chestnut-sided warbler, American woodcock, Canada warbler, blackburnian warbler, and bald eagle.

***Rationale:***
This large, contiguous block of matrix forest has been identified as a conservation priority by a host of partners including the State of New Hampshire's Wildlife Action Plan, the Nature Conservancy's Lower New England-Northern Piedmont Ecoregional Plan, and the Quabbin-to-Cardigan Collaborative Conservation Plan. We envision healthy forests within the Ashuelot CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of New Hampshire's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010).

Ashuelot CFA's hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is most certainly available within the CFA. To date our review of Ashuelot's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Ashuelot comes exclusively from a reading of forest history in New England— a legacy of intensive past-use has altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of Ashuelot are remarkably more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach combining passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Ashuelot will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided

warbler, ruffed grouse, bald eagles, and—if wetlands and riparian areas are present— Canada warbler (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009).

Ashuelot's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0 to 5 feet in height) are of particular importance. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who are thought to be strongly associated with the hemlock forests within Ashuelot—and have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—when along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near open bodies of water, are utilized by bald eagles. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Identify forest stands where soils and species composition will support woodcock management.

- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.
- Reserve supracanopy trees in proximity to important habitats during management activities.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Hardwood Swamps)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for priority refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Ashuelot River Conservation Focus Area (CFA), hardwood swamps frequently have been altered and have potential for restoration. This habitat type in Ashuelot is found in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the watertable drives complexes of forest upland and wetland species including pin oak, red maple, sweetgum, and black gum. Within the Connecticut River watershed, including the CFA, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions and soil compaction remain as threats.

Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Ashuelot will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats and riparian areas will create high-quality habitat for neotropical migratory birds. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites. Hardwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Many species of conservation concern use forested swamps, including northern parula, willow flycatcher, white-eyed vireo, and rose-breasted grosbeak. Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well-developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Hardwood swamps in the Ashuelot CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Hardwood swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Ashuelot CFA, and allow monitoring of population response to management actions (Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State of New Hampshire, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Map vernal pools and seeps.
- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Conifer Swamps)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Ashuelot CFA, softwood swamps have undergone significant alteration and have potential for restoration. This habitat type is often found in small patches on mineral soils that are nutrient poor; there may be an organic layer, but generally deep peat soils are absent. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. The dynamic nature of the watertable drives complexes of forest upland and wetland species including red maple, balsam fir, red spruce, and ash species. Where soils tend more to alkaline conditions white cedar is a common tree species, and the shrub layer is generally more diverse. Within the Connecticut River watershed, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in softwood swamps are not well understood. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Ashuelot will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Where needed, restoration of softwood swamp habitats will create high-quality habitat for neotropical migratory birds. Closed canopy softwood forests that include white cedar and other softwoods provide important mast, food, nesting, and cover. Softwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well-developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Conifer swamps in the Ashuelot CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Conifer swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Ashuelot CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State of New Hampshire, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1d. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependant on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of a woodcock management area. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season, and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests in the vicinity of foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1e. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Ashuelot CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the Ashuelot watershed.

Our coarse-scale habitat analysis of this CFA identifies the majority of the wetlands are scattered throughout with the largest freshwater marsh acreage occurring within a large wetland complex on the north end of Surry Mountain Lake. This particular wetland complex, adjacent to open water habitat, would provide important breeding and foraging habitat for American black duck, and other waterfowl species. Located within the Connecticut River watershed, an important migration corridor, this area would also be important as staging areas for migrating waterfowl. An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for waterfowl species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate wetland hydrology for impacts to natural flow regimes.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Inventory wetland plant communities.
- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Over two percent of the Ashuelot CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
See rationale for sub-objective 1.1e.

Habitats that occur within the Ashuelot CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to

bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout, American eel, and dwarf wedgemussel. Also provide undisturbed breeding and foraging habitat for American black duck, and staging areas for migrating waterfowl.

***Rationale:***
The Ashuelot River CFA supports numerous pond, wetland and river habitats. A portion of the Ashuelot River (from Village Pond to Surry Mountain Lake) meanders through the hilly terrain of the CFA. The main stem and tributaries provide habitat for American eel, and possibly eastern brook trout. A species inventory will be necessary to confirm brook trout presence. The Ashuelot River, below Surry Mountain Lake, also supports the federally endangered dwarf wedgemussel. This species requires stable bank conditions afforded by gravel or sandy substrates, and good water quality (U.S. Fish and Wildlife Service 1993, Nedeau et al. 2000).

Surry Mountain Lake is located in the southern portion of the CFA. This man-made lake is associated with the Surry Mountain Dam, which was built on the Ashuelot River in 1941 by the U.S. Army Corps of Engineers to prevent flooding along the Connecticut River. This 265-acre lake is managed by New Hampshire Fish and Game Department and the Army Corps of Engineers, and supports various species of bass, crappie, walleye, and lake trout. Backwater areas and wetlands surrounding Surry Mountain Lake may provide quality breeding, foraging and stopover habitat for American black duck, and other waterfowl species.

The aquatic habitats in the Ashuelot CFA are diverse, and provide habitat for a variety of wildlife species. Development and human activities may have impacted water quality and infringed on aquatic species movements and life cycles. Clear aquatic species passage to spawning and wintering habitat and structurally diverse in-stream habitat are important to the survival of aquatic species in this CFA. High water quality is essential to the survival of current and future dwarf wedgemussel populations. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Work with partners to implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to identify manmade physical barriers (e.g. impassable road crossings, culverts and dams) to the movement of fish and other aquatic organisms.
- Work with partners to conduct stream assessments to evaluate stream and fish community health.
- Work with partners to evaluate dwarf wedge mussel populations, and determine best management strategies for the maintenance of this species in the CFA.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Ashuelot River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Ashuelot River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Ashuelot River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Ashuelot River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Ashuelot River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Ashuelot River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Ashuelot River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Ashuelot River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, and printed media at the Ashuelot River Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures (e.g., general brochure and bird checklist) that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Ashuelot River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Ashuelot River Division would be unstaffed and is not anticipated to have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations and division-specific regulations, if necessary.

***Rationale:***
Hunting is a priority public use, allowed on national wildlife refuges, as long as it is found to be a compatible use. The Ashuelot River CFA is a popular area to hunt white-tailed deer, Eastern wild turkey, and small game. There is a moose season, but the number of tags is limited. Hunting, consistent with the final compatibility determination, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.

  (a) The season for hunting snowshoe hare and coyotes with dogs is from October 1 to March 15.

  (b) Use of bait is prohibited.

  (c) Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with New Hampshire Fish and Game Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Ashuelot River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Ashuelot River Division after completing all administrative procedures to officially open refuge lands to fishing, based on New Hampshire Fish and Game Department regulations, and any division-specific conditions.

***Rationale:***
The Ashuelot River is the longest tributary of the Connecticut River in New Hampshire. Aquatic habitats include an Army Corps of Engineers Reservoir (Surry Mountain Lake), and both cold and warm water stream reaches. The reservoir supports perch, pickerel, bass, and crappie. The river has stocked trout and native Eastern brook trout in colder reaches and warm water species like large and small mouth bass near the confluence with the Connecticut River. Fishing is a popular activity throughout the river would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Ashuelot River Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land with fishable waters:*

- Work with the New Hampshire Fish and Game Department to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. To facilitate fishing, the refuge will make information readily available to interested anglers regarding opportunities on Service-owned land, location of fishable waters, and available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity in southern New Hampshire. Local organizations such as the Monadnock Chapter of New Hampshire Audubon, the Harris Center for Conservation Education, and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.
- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring sufficient land:*

- Develop a public access strategy and complete the required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**

Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***

The entire division would likely be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**

(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring sufficient land:*

- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, Big Sit, etc.
- Encourage local schools and groups such as the Monadnock Chapter of New Hampshire Audubon, the Harris Center for Conservation Education, and other environmental organizations to offer wildlife-centered trips to the division.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring sufficient land:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge visitor services plan.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**

*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Ashuelot River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Examples include the Connecticut River waterway route. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- Work with public and private partners to determine whether and what roles this division might contribute to a Connecticut River waterway route.
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Ashuelot River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Ashuelot River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of acquiring sufficient land:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Blueberry Swamp Conservation Focus Area
# (Existing Refuge Division)

## Columbia, New Hampshire

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 4,754 | 100 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *1,166* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *3,588* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 0 | 0 % |
| Total Acres in CFA[2, 4] | 4,754 | 100 % |

[1]Acres from Service's Realty program (surveyed acres),[2]Acres calculated using GIS;[3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The existing Blueberry Swamp Division was established on December 18, 2007 and is now approximately 1,166 acres. Near the existing division is a large core of conserved lands: the 18,400-acre Bunnell Mountain Forestry Legacy tract and the 40,000 acre Nash Stream State Forest. These two conserved areas protect one of the largest contiguous blocks of high-elevation spruce forest in New England. Our existing division and proposed expansion would connect to this block and conserve the large wetland area that drains these two areas and connects to the Connecticut River. Our proposed expansion would increase the habitat diversity of the area by adding lower elevation wetlands to the larger conserved area. The wetlands complex includes Simms Stream, which empties directly into the Connecticut River as well as conifer swamps. Protection of this stream and other wetland areas would help conserve water quality and cold-water streams for eastern brook trout and other aquatic species.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Conifer Swamp/ Spruce-fir – 54.0%
- Shrub Swamps and Floodplain Forest - 4.6%
- Pasture/Hay/Grassland – 2.7%

For more information on habitats in the CFA, see map A.45 and table A.33.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.34 below, there are seven Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN), as well as species that require large contiguous forest tracts such as forest interior dwelling bird species. These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Blueberry Swamp CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

   The Blueberry Swamp CFA provides over 4,600 acres of contiguous habitat for a diversity of migratory landbirds. Over half of the CFA is spruce-fir forest, which may provide habitat for uncommon boreal species including boreal chickadee, black-backed woodpecker, spruce grouse, gray jay, bay-breasted warbler, rusty blackbird, blackpoll warbler, and olive-sided flycatcher. The hardwood forests may provide habitat for other species of conservation concern, including PRRC species such as Canada warbler, blackburnian warbler, black-throated blue warbler, and American woodcock.

   Almost three percent of the Blueberry Swamp CFA is in agriculture, consisting mostly of large hayfields between 25 to 30 acres, and could be combined to provide a larger contiguous block. Many grassland birds are area sensitive, and require large grassland acres (greater than 25 acres or 10 hectares) including grasshopper sparrows, bobolinks, eastern meadowlarks, and upland sandpiper (Vickery et al. 1994), while other species, such as the American woodcock, do not require extensive open habitat acres.

   Grasslands are a high priority habitat for the state of New Hampshire. These habitats provide breeding and nesting habitat for several state threatened and endangered species, including Northern harrier, upland sandpiper, eastern meadowlark, and grasshopper sparrow. Northern harriers breed in large grassland habitats in northern Coos County, including the Blueberry Swamp CFA, where the hayfields have declined 10 percent over the course of 10 years (Oehler et al. 2006).

2. **Waterfowl**
   The large wetland complex known as "Blueberry Swamp" may provide breeding and foraging habitat for American black duck, a PRRC species, as well as wood duck, Canada geese, and other waterfowl species.

3. **Diadromous fish and other aquatic species**
   Simms Stream, the East Branch of Simms Stream, and various brooks within the Blueberry Swamp CFA support wild brook trout populations as well as slimy sculpin, a State species of greatest conservation need. Brook trout are a PRRC species, and are a species of conservation concern for the Service's Northeast Region.

   Although, not documented within this particular area, northern redbelly dace and/or finescale dace, both species of state conservation concern, are likely to occupy beaver ponds and other aquatic systems associated with slow moving streams. These species would benefit from efforts focusing on increasing and restoring stream riparian areas and connectivity (road crossing designs that incorporate aquatic species passage). Land protection efforts within this area would also benefit resident fish species that occupy the Connecticut River, about 5 miles downstream from the CFA. These species include round whitefish and tessellated darter (host species to the dwarf wedgemussel).

4. **Wetlands**
   The Blueberry Swamp CFA contains a large wetland complex of approximately 430 acres known as "Blueberry Swamp." This wetland is mostly shrub swamp and cedar swamp, with a small portion of freshwater marsh. The slow moving waters of the East Branch of Simms Stream forms the eastern boundary. Additional wetlands occur along Simms Stream, and other areas in the CFA.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

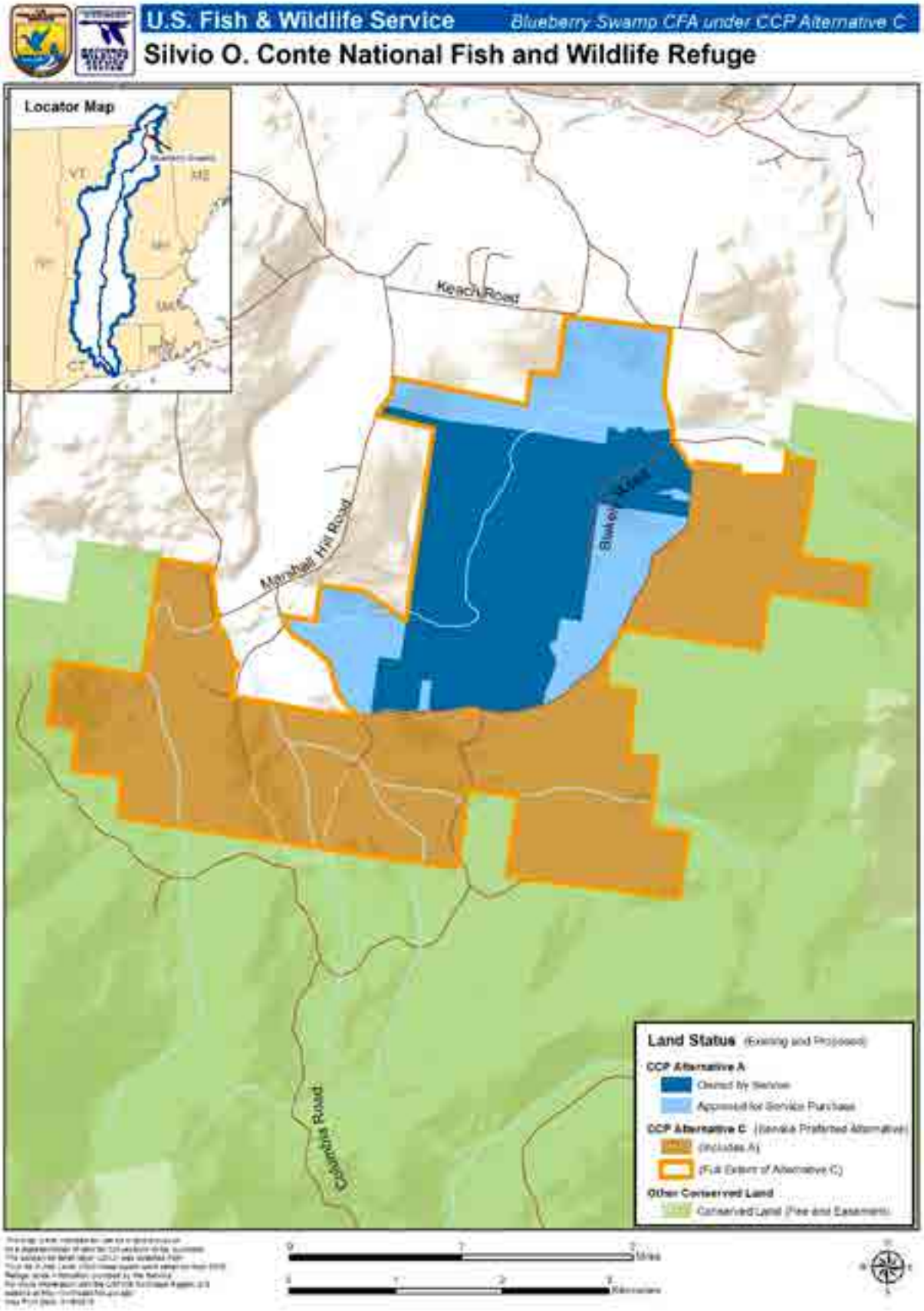
We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and native species will dominate. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition, while management within pasture, hay, grassland habitats will provide grassland and shrub habitats. Invasive plant management will be a priority.
- In open water (stream, rivers, ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six priority, wildlife-dependent recreational opportunities: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

*Map A.44. Blueberry Swamp CFA – Location.*



*Map A.45. Blueberry Swamp CPA/CFA – Habitat Types.*

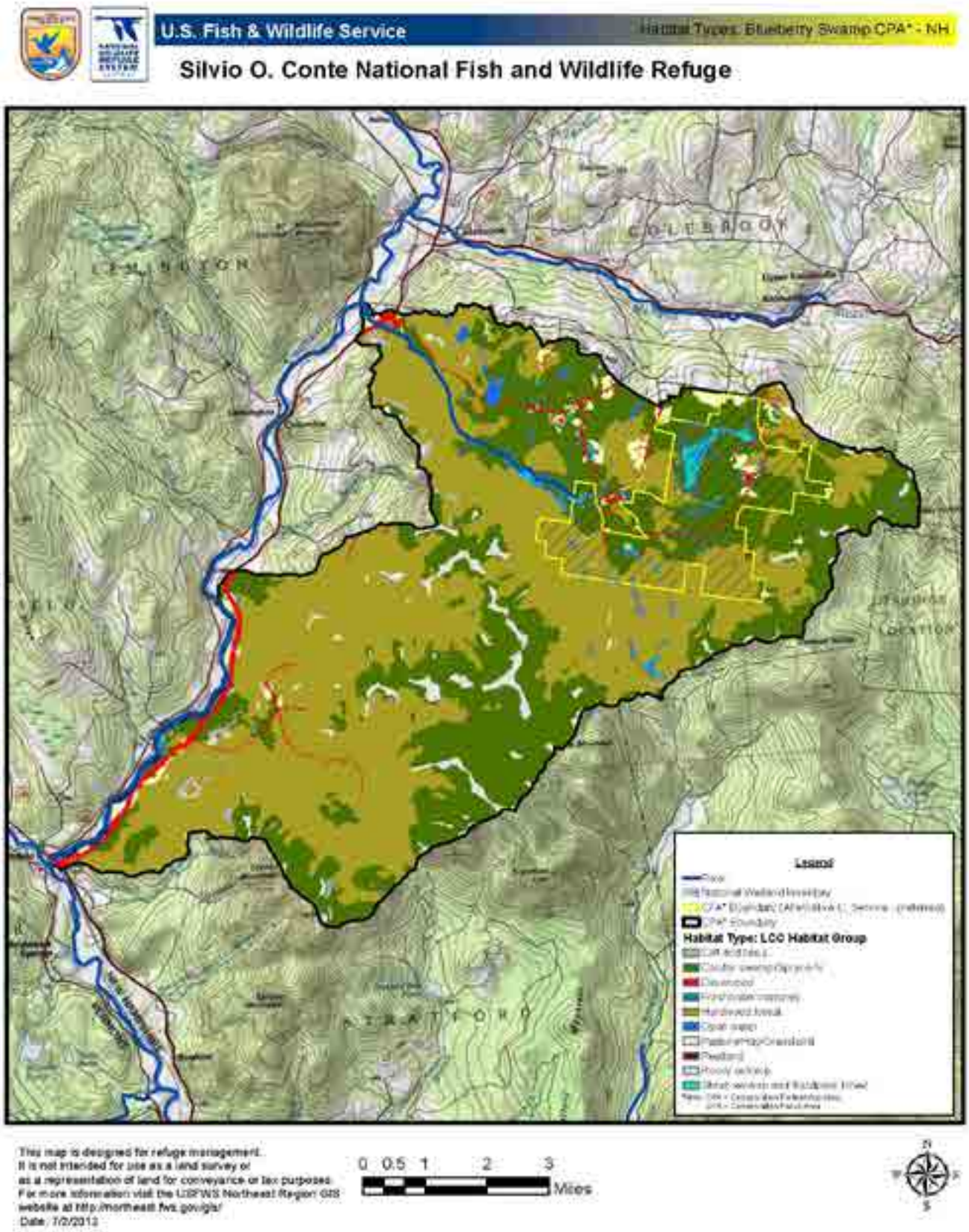


**Table A.33. Blueberry Swamp CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 14,905 | 37.7% | 2,496 | 0 | 671 | 54.0% | 16.7% |
| Hardwood forest | 21,122 | 53.5% | 1,676 | 0 | 184 | 36.2% | 7.9% |
| Shrub swamp and floodplain forest | 380 | 1.0% | 211 | 0 | 141 | 4.6% | 55.6% |
| *Forested uplands and wetlands subtotal* | *36,408* | *92.2%* | *4,384* | *0* | *996* | *94.8%* | *12.0%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 256 | 0.6% | 0 | 0 | 0 | 0.0% | 0.0% |
| Freshwater marshes | 127 | 0.3% | 23 | 0 | 14 | 0.5% | 18.0% |
| Pasture/hay/grassland | 732 | 1.9% | 125 | 0 | 20 | 2.7% | 17.1% |
| Peatland | 4 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky outcrop | 1,092 | 2.8% | 11 | 0 | 0 | 0.2% | 1.0% |
| *Non-forested uplands and wetlands subtotal* | *2,212* | *5.6%* | *159* | *0* | *34* | *3.4%* | *7.2%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 119 | 0.3% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Inland aquatic habitats subtotal* | *119* | *0.3%* | *0* | 0 | *0* | *0.0%* | *0.0%* |
| **Other** | | | | | | | |
| Developed | 764 | 1.9% | 84 | 0 | 16 | 1.8% | 10.9% |
| *Other subtotal* | *764* | *1.9%* | *84* | *0* | *16* | *1.8%* | *10.9%* |
| **TOTAL** | **39,503** | **100.0%** | **4,627** | **0** | **1,046** | **100.0%** | **11.7%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.34. Blueberry Swamp CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp/Spruce-fir Forest[5] - 2,496 acres** | | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | Cape May Warbler[A, J]<br>Boreal Chickadee[A, J]<br>Purple Finch[A, J]<br>Black-throated Green Warbler[A, J]<br>**Spruce Grouse [A, I]**<br>**American Marten[I]**<br>Canada Lynx[I, J]<br>Gray Jay[A, I, J]<br>Black-backed Woodpecker [A, I, J]<br>Bay-breasted Warbler[A, I, J]<br>**White-throated Sparrow**<br>**Blackpoll Warbler[A, I]**<br>Brown Creeper[J]<br>Northern Saw-whet Owl[J]<br>Olive-sided Flycatcher[A, I, J]<br>Palm Warbler[A,J]<br>Pine Grosbeak[A, J]<br>Northern Parula[A]<br>Sharp-shinned Hawk[J]<br>Yellow-bellied Flycatcher[J] |
| Rusty Blackbird[A, C] | Breeding habitat includes conifer dominated forested wetlands interspersed with shrub swamps and peatlands. Young spruce and fir may be required for nesting (Greenland et al, 2010, Powell et al., 2010, and Matsuoka et al, 2010). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| **Hardwood Forest[5] - 1,676 acres** | | |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | **Ruffed Grouse[A, I]**<br>Whip-poor-will[A, I, J]<br>Canada Lynx[I]<br>**Chestnut-sided Warbler[A, I]**<br>**Ovenbird[A]**<br>**Eastern Red Bat[I]**<br>American Redstart[A, J]<br>Veery[A]<br>Black-and-white Warbler[J]<br>Broad-winged hawk[J]<br>Eastern Wood-pewee[A, J]<br>Northern Flicker[A, J]<br>Northern Goshawk[A, I, J]<br>Red-shouldered Hawk[I, J]<br>Sharp-shinned Hawk[J]<br>Northern Parula[A]<br>Yellow-bellied Sapsucker[A, J] |
| Black-throated Blue Warbler[A] | Breeding habitat includes mature deciduous and mixed deciduous/conifer forests with a shrubby understory (Degraaf et al. 2001, Hodgman et al. 2000, Dobbs 2007, Dunn et al. 1997) | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 211 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands, and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | Northern Harrier[A,I]<br>Chestnut-sided Warbler[A,I]<br>American Redstart[A,J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>**Warbling Vireo**<br>**Willow Flycatcher**<br>Northern Leopard Frog[I]<br>Ruffed Grouse[A,I] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 23 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Pasture/Hay/Grassland [5] – 125 acres** | | |
| Maintain as contiguous block of pasture/hay/grassland habitat | These habitat types include ruderal uplands and old-fields such as abandoned pastures; lands that are intensively managed for cool season grasses, such as Canada rye, redtop, and June grass or warm season grasses, such as switch grass, indian grass and blue stem; and hayfields/pastures that are intensively managed for cool season grasses or are active pastures (Gawler 2008). | American Woodcock[A,I,J]<br>Field Sparrow[J]<br>Northern Harrier[A,I,J]<br>Common Night Hawik[A,I]<br>**Bobolink[A]**<br>**Grasshopper Sparrow[I]**<br>**Eastern Meadowlark[I]** |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Rocky Outcrop[5] – 11 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | *The Northern Appalachian-Acadian rocky heath outcrop* system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including sheep laurel, low-bush blueberry, black huckleberry, and black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] –** *(GIS data did not capture acreage due to dense forest cover along small stream and river corridors)* | | |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | **Slimy Sculpin[I]**<br>Northern Redbelly Dace[I]<br>Wood Turtle[I] |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2006 New Hampshire Wildlife Action Plan (Species of Greatest Concern)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Blueberry Swamp CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including black-throated blue warbler, and American woodcock.

***Rationale:***
We envision healthy forests within the Blueberry Swamp CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of New Hampshire's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Blueberry Swamp CFA's hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is most certainly available within the CFA. However, to date our review of Blueberry Swamp's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Blueberry Swamp comes exclusively from a reading of forest history in New England—a legacy of intensive past-use has altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of Blueberry Swamp are remarkably more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory will test these assumptions, and aid in identifying stands where a forest management approach combining passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Blueberry Swamp will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, and—if wetlands and riparian areas are present—Canada warbler (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Blueberry Swamp's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance to species like black-throated blue warbler and Canada warbler. These habitat elements may have importance to declining mature forest-interior species like blackburnian warbler—identified as a representative species by the North Atlantic Landscape Conservation Collaboration. Black-throated blue warblers nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Bull 1974, Darveau et al. 1992, DeGraaf and Yamasaki 2001). Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who dwell in the upper canopies of conifers, and are thought to be strongly associated with the hemlock forests within Blueberry Swamp. Blackburnian warblers have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like black-throated blue warblers who often nest in the fork of coniferous or deciduous saplings. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, wood thrush, and—when found on wetter soils—Canada warbler.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like American marten, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Identify forest stands where soils and species composition will support woodcock management.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species, such as glossy buckthorn, are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map vernal pools and seeps.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1b. (Shrub swamp and floodplain forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance. Most shrub swamps maintain themselves, but tree species, such as red maple, can become established, and dominate the wetland community. Invasive plants, such as common reed, are a threat to these communities, and mechanical and chemical treatment of this invasive reed is necessary. Management of these shrub swamps will not only benefit American woodcock, but other shrub swamp specialists, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests in the vicinity of foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Ensure a diversity of native species is present and non-native species, such as glossy buckthorn, are excluded or managed to keep population levels as low as possible.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Inventory wetland plant communities.
- Evaluate wetland hydrology for impacts to natural flow regimes.
- Survey wildlife use of wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Conifer Swamp/Spruce-fir)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve landscape connectivity of spruce-fir habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including Blackburnian warbler, rusty blackbird, and Canada warbler.

***Rationale**:*
Of the forest types within the Blueberry CFA, spruce-fir forest and softwood swamps have undergone significant alteration and has the greatest potential for restoration. Pre-European settlement, most forest stands in this habitat type consisted primarily of long lived red spruce with varying components of balsam fir, white birch, and other overstory species. Within the Northern Forest region, including the CFA, utilitarian forest management practices converted tens of thousands of acres to homogeneous second or third growth stands more heavily dominated by balsam fir. By some estimates, less than 1 percent of the area formerly covered by the late successional stage of this habitat type still exists in the northeastern United States (Williams 1992, Whitney 1996, Hagan and Whitman 2004). Fortunately, emerging research (Franklin et al. 2002, Keeton 2006, North and Keeton 2008, Smith et al. 2008b, 2008a) has shown silvicultural systems designed to mimic the natural disturbance regimes endemic to this habitat type have restorative qualities. These and future studies will inform efforts to restore this habitat type. Future management should focus on promoting the ecological integrity of these stands and (where and when possible) restoring composition and structure to accepted historical conditions.

Blackburnian warbler, Canada warbler and rusty blackbird use different seral stages within the spruce-fir forest. Blackburnian warblers use mature conifer forests of spruce, fir, hemlock, and pines, and mixed wood habitats including deciduous stands with patches of conifer (Morse 1994, Dunn and Garrett 1997, DeGraaf and Yamasaki 2001). They are considered a forest interior species, making them susceptible to forest fragmentation and short rotation timber harvesting (Morse 1994, Hagan et al. 1996). The Blueberry Swamp CFA is in the core of its range, and management for this species will also provide habitat for bay-breasted warbler, boreal chickadee, black-backed woodpecker, and gray jay.

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well-developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009).

Rusty blackbirds nest in shrub swamps and along riparian areas within spruce-fir forested wetlands. Disturbances such as beaver activity and wind throws create forest openings allowing softwood regeneration and potential rusty blackbird habitat (Avery 1995).

The management priorities for this habitat type, including structural diversity and landscape connectivity, and habitat requirements for priority resources of concern, will benefit other species of conservation concern such as spruce grouse, Canada lynx, and wintering deer.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Identify forest stands where soils and species composition will support woodcock management.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.
- Ensure this habitat type provides effective winter shelter for white-tailed deer, consistent with management of refuge resources of concern.
- Evaluate hydrologic regime to inform restoration efforts.

*Within 10 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species, such as glossy buckthorn, are excluded or managed to keep population levels as low as possible.
- Implement identified active forest management opportunities by using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Where appropriate, emulate the natural disturbance regime inherent to the forest types within this broad habitat type and work within the confines of seral pathways dictated by soil, climate, and hydrology.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Pasture/Hay/Grassland)**
Maintain a contiguous block of pasture, hay, and grassland habitat to provide breeding and foraging habitat for various grassland birds. Management will also benefit refuge priority resources of concern including American woodcock.

***Rationale:***
Native grassland was once more widespread in North America. A deterioration of rangelands, the conversion of prairies to agriculture, and afforestation of the eastern United States are significant factors to the decline of grassland bird populations. During European settlement millions of hectares of forests were cleared for agriculture in the eastern U.S. creating habitat for grassland dependent birds. As agricultural activities declined, open areas dominated by herbaceous vegetation began to convert back to forests, causing a drastic decline in

grassland species in the region. Naturally occurring grassland ecosystems were not uncommon in the eastern U.S., but, were found closer to the coast rather than inland (Brennan and Kuvlesky Jr 2005). These grassland ecosystems have since been impacted by development and fragmentation.

Grasslands are a high priority habitat for the state of New Hampshire. These habitats provide breeding and nesting habitat for several state threatened and endangered species, including northern harrier, upland sandpiper, eastern meadowlark, and grasshopper sparrow. Northern harriers are breeding in large grassland habitats in northern Coos County, including the Blueberry Swamp CFA, where the amount of hayfields has declined 10 percent over the course of 10 years (Oehler et al. 2006).

Almost three percent of the Blueberry Swamp CFA is in agriculture, consisting mostly of large hayfields between 25 to 30 acres, and could be combined to provide a larger contiguous block. Many grassland birds are area sensitive, and require large grassland acres (greater than 25 acres or 10 hectares) including grasshopper sparrows, bobolinks, eastern meadowlarks, and upland sandpiper (Vickery et al. 1994), while other species, such as the American woodcock, do not require extensive open habitat acres.

Management in the Blueberry Swamp CFA will focus on maintaining contiguous grassland habitat with a variety of structure and native herbaceous species. A mixture of grasses, and broad-leaved forbs with scattered shrubs or clumps of herbaceous vegetation will provide roosting, and potential feeding areas, for American woodcock, and breeding and foraging habitat for bobolinks and northern harrier. While sparsely vegetated areas of approximately a half acre will provide courtship sites for woodcock. Grasslands that are outside the contiguous grassland acres may be managed as shrublands or converted back to forest depending on the location.

Due to our unfamiliarity with the habitat conditions in the CFA, a comprehensive, multi-scale habitat and wildlife inventory will be necessary to implement refuge strategies. This inventory will need to encompass all habitats within the CFA and associated landscape. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Ensure a diversity of native species is present and non-native species, such as glossy buckthorn autumn olive, reed canary grass, and Canada thistle, are excluded or managed to keep population levels as low as possible.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Assess the condition of pasture, hay and grassland habitats, as well as the overall size and location in the CFA, and proximity to other forest openings, to inform more detailed management strategies in an HMP.

**Sub-objective 1.2b. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted

climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Blueberry Swamp CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout.

***Rationale:***
Simms Stream, the East Branch of Simms Stream, and various brooks within the Blueberry Swamp CFA support wild brook trout populations, as well as slimy sculpin, a state species of greatest conservation need. Although, not documented within this particular area, northern redbelly dace and/or finescale dace, both species of state conservation concern, are likely to occupy beaver ponds and other aquatic systems associated with slow moving streams. These species would benefit from efforts focusing on increasing and restoring stream riparian areas and connectivity (road crossing designs that incorporate aquatic species passage). Land protection efforts within this area would also benefit resident fish species that occupy the Connecticut River, about 5 miles downstream from the CFA. These species include round whitefish and tessellated darter (host species to the dwarf wedge mussel).

Management of water resources in the Blueberry Swamp CFA will provide clear aquatic species passage to spawning and wintering habitat, structurally diverse instream habitat, with boulders and downed woody debris providing riffles and pools, and shade trees along riparian edges. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent on not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of the water resources in the CFA at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*
- Implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Conduct stream assessments to evaluate stream and fish community health.
- Identify man-made physical barriers (e.g. impassable road crossings, culverts and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Blueberry Swamp Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Blueberry Swamp Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Blueberry Swamp Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Blueberry Swamp Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Blueberry Swamp Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Blueberry Swamp Division wil be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Blueberry Swamp Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Blueberry Swamp Division.
- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See the rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Blueberry Swamp Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge Web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures (e.g., general brochure and bird checklist) that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Blueberry Swamp Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Blueberry Swamp Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations and division-specific regulations, if necessary.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. Blueberry Swamp has been a popular area with hunters for many years prior to acquisition by the Service. All of the division is currently open to hunting. Retaining hunting opportunities at this division conforms to historic use on this property and much of the surrounding land in the area. Popular game species include white-tailed deer, moose, ruffed grouse, American woodcock, black bear, and snowshoe hare. Allowing hunters to use public lands helps ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
*Continue to:*

- Allow hunter access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise to 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain hunting on the division, based on New Hampshire Fish and Game Department and the following division-specific regulations:

  (a) The season for hunting snowshoe hare and coyotes with dogs is from October 1 to March 15.

  (b) Use of bait is prohibited.

  (c) Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of CCP approval:*
- Work with New Hampshire Fish and Game Department to determine whether opportunities exist for State-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Work with New Hampshire Fish and Game Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Within 1 year of CCP approval:*
- Produce a hunt brochure that includes information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Blueberry Swamp Division kiosks, through a friends group, and in local businesses.

- Work with New Hampshire Fish and Game Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

*Within 5 years of CCP approval:*
- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Blueberry Swamp Division. Complete all administrative procedures to officially open refuge lands to fishing, based on New Hampshire Fish and Game Department regulations, and division-specific conditions, if necessary.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The division has been open to fishing, following acquisitions, through pre-acquisition compatibility determinations, but no formal opening package or fishing plan has been completed. Although fishing is not as popular as hunting at this division, there still are opportunities for visitors to fish the East Branch of Simms Stream.

**Management Strategies:**
*Continue to:*

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Install an informational kiosk in a conspicuous location to post information on fishing seasons and other notices to visitors.
- The Blueberry Swamp Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of CCP approval:*

- Work with the New Hampshire Fish and Game Department to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Although most dedicated anglers will be drawn to the nearby White Mountain National Forest, the Connecticut River, or other areas better known for fishing, the East Branch of Simms Stream offers the opportunity to fish for Eastern brook and rainbow trout. To facilitate fishing, the refuge will make information readily available to interested anglers regarding opportunities on Service-owned land, location of fishable waters, and available game fish.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at the division kiosk, through friends groups, and in local businesses.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in northern New Hampshire. Currently, there is no infrastructure in place at the division to support these uses, and consequently, visitation for wildlife viewing and photography is limited and dispersed.

**Management Strategies:**
*Continue to:*

- Allow wildlife observation and photography at the Blueberry Swamp Division.
- Allow public access at the Blueberry Swamp Division daily from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 10 years of CCP approval:*

- Evaluate the feasibility and demand for a native surface, primitive loop trail that through the fields and forests, and ultimately down to the East Branch of Simms Stream. Complete the required planning (i.e. NEPA, compatibility determination), if a trail is warranted.

*Within 15 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division is available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. Visitation increases are expected as this division expands and becomes better known. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of CCP approval:*

- Develop interpretive panels that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups to offer wildlife-related trips to the division.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Blueberry Swamp Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
*This sub-objective is not applicable to the Blueberry Swamp Division because there are limited opportunities for canoeing or kayaking, and the East Branch of Simms Stream is not part of a larger water-based trail network.*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Blueberry Swamp Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Blueberry Swamp Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
*Continue to:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

*Within 1 year of CCP approval*

- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Mascoma River Conservation Focus Area (Proposed)

## Lyme, Dorchester, Hanover, and Canaan, New Hampshire

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 20,601 | 91.4% |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *20,601* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 1,931 | 8.6% |
| Total Acres in CFA[2, 4] | 22,532 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

On February 23, 2015, we acquired a 761-acre easement which established the Mascoma River Division. This easement gives us the authority to manage habitat and public use in this area. The Mascoma River CFA was identified as high priority for conservation for the State of New Hampshire and contains a large, intact forested area which has diversity in elevation and aspect and includes numerous small, scattered, forested wetlands. The proposed Mascoma River CFA is located within an existing network of conserved lands, including the White Mountain National Forest, Mascoma River and Cumins Pond Wildlife Management Areas, and several privately owned tracts. Additional land protection by the Service in this area will help better connect these conserved lands. The Appalachian Trail Corridor, which crosses the proposed CFA, provides outstanding recreational opportunities. The proposed CFA would help form a better connection between the White Mountain National Forest and the Appalachian Trail.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 92.5%
- Shrub swamp and Floodplain Forest – 1.2%
- Conifer Swamp – 1.9%
- Freshwater Marsh – 0.4%

For more information on habitats in the CFA, see map A.47 and table A.35.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.36 below, there are seven Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to species that require large

contiguous forest tracts such as forest interior dwelling bird species, and State Species of Greatest Conservation Need (SGCN). These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Mascoma River CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat for a diversity of bird species.

   Habitats in the Mascoma CFA have been identified as being of "Highest Quality in New Hampshire" in the New Hampshire Wildlife Action Plan (New Hamsphire Fish and Game Department 2005). The CFA contains a mosaic of unfragmented habitats that contribute to the larger core of undeveloped land within the landscape. These habitats provide breeding habitat for a diversity of landbirds including species of conservation concern and forest interior dwelling species. This CFA is in the core range of many of these species including PRRC species such as wood thrush, chestnut-sided warbler, American woodcock, Canada warbler and blackburnian warbler. Other species of conservation concern include black-throated blue warbler, purple finch, and black-throated green warbler. Peregrine falcon is another PRRC species, as well as a State Species of Greatest Conservation Need (SGCN). The cliff and talus systems in the CFA are used by nesting peregrine falcons, where the elevations can rise above 2,000 feet.

2. **Waterfowl**
   Potential breeding and foraging habitat for American black duck, a PRRC species, as well as wood duck, Canada geese, and other waterfowl species within wetlands adjacent to slow-moving streams and open water habitats. New Hampshire Audubon observed breeding and migrating Canada geese, wood duck, mallard, ring-necked duck, and hooded merganser in ponds adjacent to the CFA. As well as American black duck, green-winged teal, and common merganser during migration (Hunt personal communication 2008).

3. **Diadromous fish and other aquatic species**
   The Mascoma River watershed supports high water quality streams that are pristine with minimal impacts from human influences. The Mascoma River CFA supports numerous minimally developed ponds, perennial and intermittent streams, and river habitats, including the Mascoma River main stem. The brooks and streams in the Mascoma River CFA provide cold water habitat for Eastern brook trout, a PRRC species and conservation priority for the Service's Northeast Region.

4. **Wetlands**
   The Mascoma River CFA contains 2 acres of hardwood swamp, 429 acres of conifer swamp, 276 acres shrub-swamp and floodplain forest, 18 acres of peatland and 99 acres of freshwater marsh. Many of these wetlands occur along slow moving streams or small ponds. Habitat patches range from 2 acres to 124 acres in size.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and native species will dominate. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers, and ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

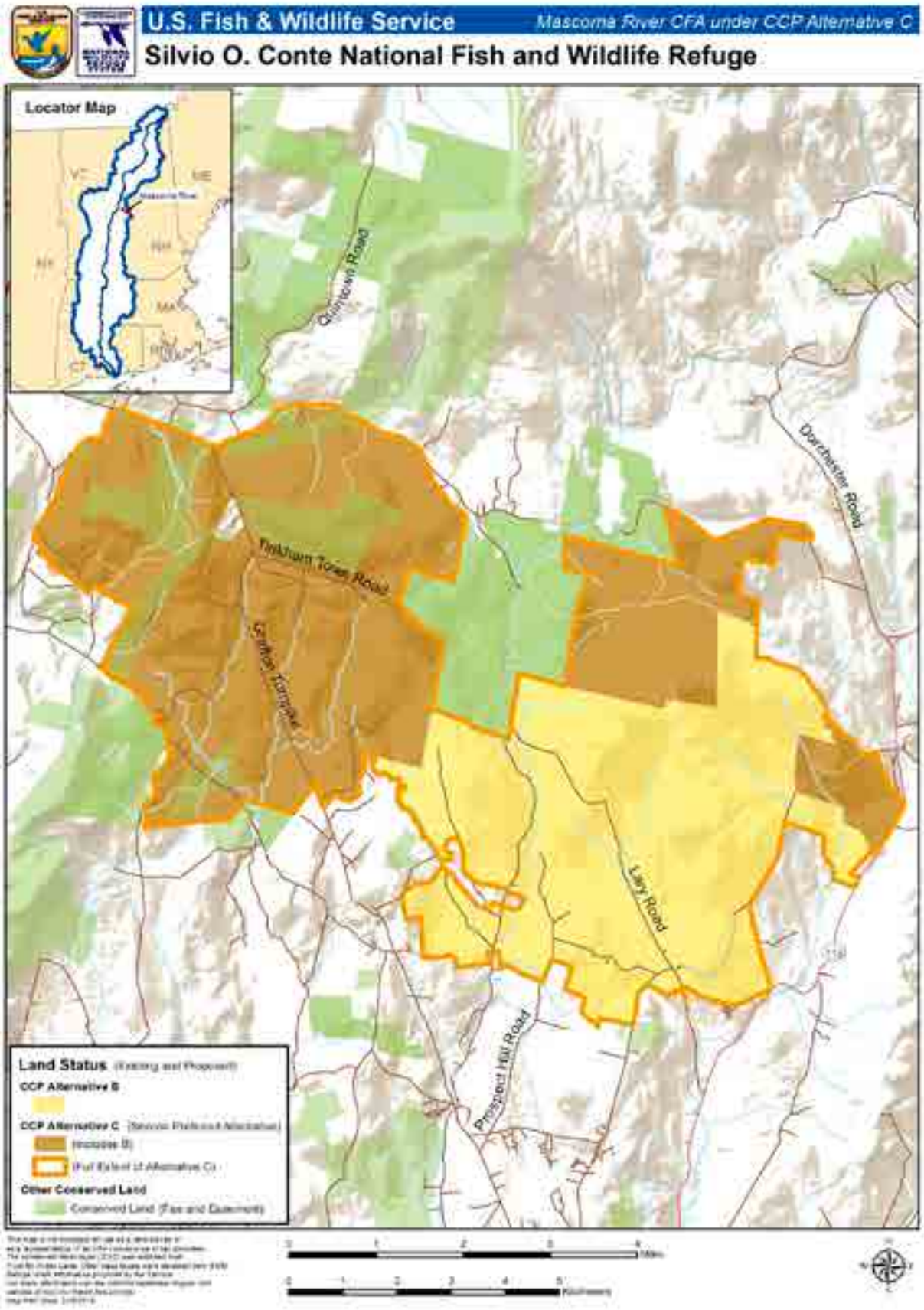
## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We would focus on providing opportunities for the six, priority public uses: wildlife observation, wildlife photography, environmental education, interpretation, hunting, and fishing.

## Were there other special considerations in delineating the CFA boundary?

- The CFA comprises a large portion of a priority matrix forest block identified in The Nature Conservancy's Lower New England-Northern Piedmont Ecoregional Plan.
- This area was identified as a conservation focus area priority in the Quabbin-to-Cardigan Collaborative Conservation Plan.

*Map A.46. Mascoma River CFA – Location.*



*Map A.47. Mascoma River CPA/CFA – Habitat Types.*

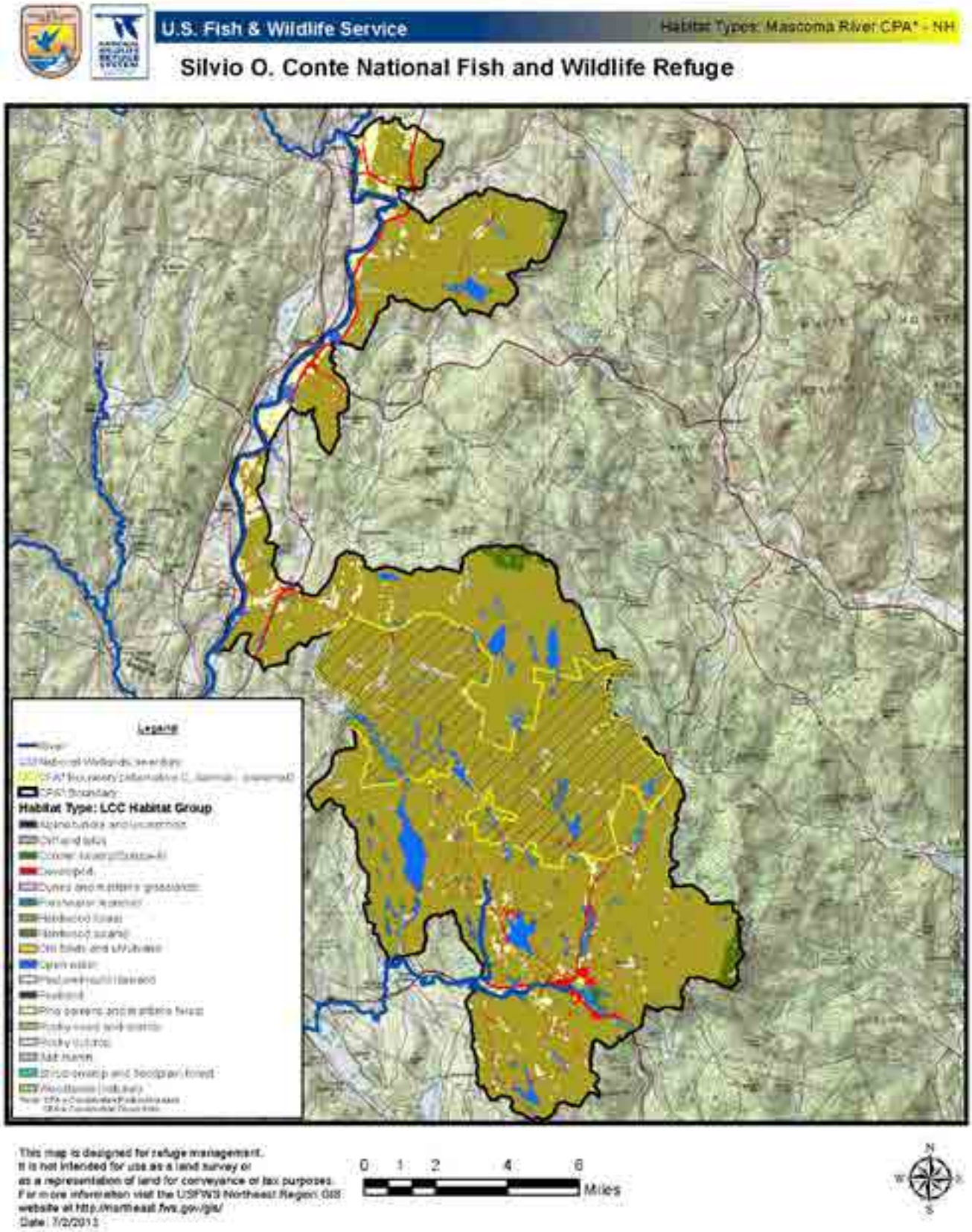


**Table A.35. Mascoma River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 2,560 | 2.8% | 429 | 33 | 0 | 1.9% | 16.8% |
| Hardwood forest | 77,212 | 83.2% | 20,868 | 1,742 | 0 | 92.5% | 27.0% |
| Hardwood swamp | 98 | 0.1% | 2 | 0 | 0 | 0.0% | 2.3% |
| Shrub swamp and floodplain forest | 778 | 0.8% | 276 | 42 | 0 | 1.2% | 35.5% |
| Woodlands (natural) | 143 | 0.2% | 12 | 0 | 0 | 0.1% | 8.4% |
| *Forested uplands and wetlands subtotal* | *80,792* | *87.0%* | *21,588* | *1,817* | *0* | *95.7%* | *26.7%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 746 | 0.8% | 233 | 82 | 0 | 1.0% | 31.2% |
| Freshwater marshes | 398 | 0.4% | 99 | 7 | 0 | 0.4% | 24.9% |
| Pasture/hay/grassland | 4,634 | 5.0% | 103 | 6 | 0 | 0.5% | 2.2% |
| Peatland | 65 | 0.1% | 18 | 0 | 0 | 0.1% | 27.2% |
| Rocky outcrop | 601 | 0.6% | 280 | 85 | 0 | 1.2% | 46.5% |
| *Non-forested uplands and wetlands subtotal* | *6,443* | *6.9%* | *732* | *179* | *0* | *3.2%* | *11.4%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 2,888 | 3.1% | 96 | 4 | 0 | 0.4% | 3.3% |
| *Inland aquatic habitats subtotal* | *2,888* | *3.1%* | *96* | 4 | *0* | *0.4%* | *3.3%* |
| **Other** | | | | | | | |
| Developed | 2,701 | 2.9% | 153 | 10 | 0 | 0.7% | 5.7% |
| *Other subtotal* | *2,701* | *2.9%* | *153* | *10* | *0* | *0.7%* | *5.7%* |
| **TOTAL** | **92,825** | **100.0%** | **22,568** | **2,011** | **0** | **100.0%** | **24.3%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.36. Mascoma River CFA – Preliminary Priority Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 20,868 acres** | | |
| **Wood Thrush[A, B, C]** | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Red-shouldered Hawk[I,J]<br>Bobcat[I]<br>**Ovenbird[A]**<br>Eastern Wood Pewee[A,J]<br>Veery[A]<br>Northern Flicker[A,J]<br>Yellow-bellied Sapsucker[A]<br>Rose-breasted Grosbeak[A]<br>**Eastern Red Bat[I]**<br>**Louisiana Waterthrush**<br>American Redstart[A,J]<br>Black-and-white Warbler[J]<br>Black-billed Cuckoo[A,J]<br>Black-throated Blue Warbler[A]<br>Black-throated Blue Warbler[A]<br>Great-crested Flycatcher[J]<br>Northern Goshawk[A,I,J]<br>Red-shouldered Hawk[I,J]<br>Scarlet Tanager[J]<br>Sharp-shinned Hawk[J]<br>Purple Finch[A,I]<br>Ruffed Grouse[A]<br>Black Racer[I] |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Chestnut-sided Warbler[A, B, I]** | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| **Hardwood Swamp[5] – 2 acres** | | |
| North-Central Appalachian acidic swamp[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. Eastern hemlock is usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp[5] – 429 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | Black-throated Green Warbler[A]<br>Blackburnian Warbler[A]<br>Northern Parula[A]<br>Veery[A]<br>Purple Finch[A, I] |
| **Shrub Swamp and Floodplain Forest[5] - 276 acres** | | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **Warbling Vireo**<br>**Willow Flycatcher**<br>Ruffed Grouse[A]<br>Chestnut-sided Warbler[A]<br>Veery[A]<br>American Redstart[A]<br>Canada Goose[J]<br>Mallard[J]<br>Wood Duck[J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>**Wood Turtle[I]**<br>**Spotted Turtle[I]** |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Woodlands (natural) [5] - 12 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] – 223 acres** | | |
| Peregrine Falcon[C, G] | Nests on cliffs, ledges, and talus slopes near open habitats including rivers, lakes, and marshes, and lack of human disturbance (DeGraaf et al. 2001). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Freshwater Marshes[5] - 99 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **American Bittern[A,I]**<br>**Marsh Wren**<br>**Virginia Rail[I]**<br>Great Blue Heron[I]<br>Wood Duck[A,J]<br>Canada Goose[J]<br>Mallard[J]<br>Wood Turtle[I]<br>Common Loon[A,I]<br>Spotted Turtle[I] |
| **Pasture/Hay/Grassland [5] – 103 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/ or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[J]<br>Northern Harrier[A,I,J]<br>**Bobolink[A]**<br>**Grasshopper Sparrow[I]**<br>**Eastern Meadowlark[I]** |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Peatland [5] – 18 acres** | | |
| Boreal-Laurentian-Acadian acidic basin fen[H]<br><br>Laurentian-Acadian acidic alkaline fen[H] | *Boreal-Laurentian-Acadian acidic fens* have developed in open or closed relatively shallow basins with nutrient-poor and acidic conditions. The substrate is sphagnum, and vegetation typically includes areas of dominance by grasses and dwarf-shrubs. Leatherleaf is usually present, and scattered stunted trees may occur. These fens often develop adjacent to open water. *Laurentian-Acadian acidic alkaline fens* are most abundant in areas of limestone bedrock, and widely scattered in areas where calcareous substrates are scarce. Shore fens, which are peatlands that are occasionally flooded along stream and lakeshores, are also included here because flooding tends to create moderately alkaline conditions. The vegetation may be grass-dominated, shrub-dominated, or a patchwork of the two; shrubby cinquefoil is a common diagnostic shrub. The herbaceous flora is usually species-rich and includes calcium loving grasses and forbs. Sphagnum dominates the substrate; star campylium moss is an indicator bryophyte. The edge of the basin may be shallow to deep peat over a sloping substrate, where seepage waters provide nutrients (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Forested Uplands and Wetlands[4]** | | |
| **Rocky Outcrop[5] – 280 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | The Northern Appalachian-Acadian rocky heath outcrop system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Low-bush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 96 acres** | | |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Slimy Sculpin[I]<br>Wood Turtle[I] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Canada Goose[A]<br>Wood Duck[A]<br>Hooded Merganser[J]<br>Green-winged Teal[J]<br>Mallard[J]<br>Great Blue Heron[I]<br>**Common Merganser**<br>**Ring-necked Duck**<br>**Common Loon[A,I]** |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2006 New Hampshire Wildlife Action Plan (Species of Greatest Concern)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Mascoma River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Conifer Swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Mascoma River CFA, softwood swamps frequently have been altered and have potential for restoration. This habitat type is often found in small patches on mineral soils that are nutrient poor; there may be an organic layer, but generally deep peat soils are absent. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. The dynamic nature of the watertable drives complexes of forest upland and wetland species including red maple, balsam fir, red spruce, and ash species. Where soils tend more to alkaline conditions white cedar is a common tree species, and the shrub layer is generally more diverse. Within the Connecticut River watershed, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in softwood swamps are not well understood. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Mascoma will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Where needed, restoration of softwood swamp habitats will create high-quality habitat for neotropical migratory birds. Closed canopy softwood forests that include white cedar and other softwoods provide important mast, food, nesting, and cover. Softwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blowdowns create canopy gaps. This provides a well developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Conifer swamps in the Mascoma River CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Conifer swamp patches of 10 acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Mascoma River CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of conifer swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State of New Hampshire, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, chestnut-sided warbler, American woodcock, Canada warbler, and blackburnian warbler.

***Rationale:***
We envision healthy forests within the Mascoma River CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of New Hampshire's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010). This large, contiguous block of matrix forest has been identified by a host of partners including the State of New Hampshire's Wildlife Action Plan, the Nature Conservancy's Lower New England-Northern Piedmont Ecoregional Plan, and the Quabbin-to-Cardigan Collaborative Conservation Plan.

Within the Mascoma River CFA and the watershed there are several large areas of unfragmented forest. These areas serve as refugia for wildlife, which has led the establishment of multiple wildlife management areas in the watershed. To date our review of Mascoma River's habitats and wildlife species —and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance

and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Mascoma River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use has altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of Mascoma River are remarkably more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach combining passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Mascoma River will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, and—if wetlands and riparian areas are present—Canada warbler (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009).

Mascoma River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who are thought to be strongly associated with the hemlock forests within Mascoma River—and have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—when along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.
- Identify forest stands where soils and species composition will support woodcock management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted

climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003) The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complimented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Mascoma River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1d. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA may provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of a woodcock management area. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation, and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests near foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the Mascoma River watershed.

Our coarse-scale habitat analysis of this CFA identifies these wetlands as scattered throughout the CFA, with a large percent occurring along Pressey Brook. This particular wetland complex, adjacent to a slow moving stream, may provide important breeding and foraging habitat for American black duck, and other waterfowl species. This area may also be important as staging areas for migrating waterfowl. An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for waterfowl species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Encourage local landowners to use New Hampshire Best Management Practices within active agricultural fields that are located along the perimeter of marsh habitats.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Map natural communities; protect rare or exemplary examples.
- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Survey wildlife use of existing wetlands.

**Sub-objective 1.2b. (Cliff and Talus)**
Protect cliffs, ledges and talus slopes to maintain the biological integrity, health and diversity of associated natural and rare ecological communities. Emphasis will be on sites occupied by nesting peregrine falcons.

***Rationale:***
Cliff and talus systems in this CFA generally occur below treeline at low to mid elevations. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places (Gawler 2008). The type of rock, microclimate, and soil availability from higher elevation sources directly and indirectly influence vegetation within these systems (Thompson and Sorenson 2000). Rock types may include limestone, dolmite, granite, schist, slate, or shale which breakdown differently in the environment providing varying levels of nutrients, moisture, ground stabilization, and soil availability. Sun exposure, aspect, elevation, and moisture provide different microclimate conditions impacting vegetation type and growth. These systems provide unique niches for rare and uncommon plants, and habitat for snakes, including the rare eastern timber rattlesnake,

black rat snake, and eastern garter snake. Exposed cliffs provide nesting habitat for turkey vultures, ravens, porcupines, and peregrine falcons, a state species of greatest conservation need. Peregrine falcons are also a refuge purpose species. New Hampshire's breeding population has increased steadily since they were extirpated from the Eastern US in the mid to late 1960's due to indiscriminate use of DDT following World War II. Peregrines nest on Holts Ledge in the Mascoma River CFA. Winslow Ledge, located across the valley from Holts Ledge, may provide an alternate nest site for peregrines. Monitoring and management of these sites is coordinated by New Hampshire Audubon.

Management of cliff and talus systems in the Mascoma River CFA will begin with a comprehensive, multi-scale wildlife and habitat inventory. Wildlife species survival and breeding success is dependent on habitat at a fine scale and the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of cliff and talus systems at the time of acquisition, and communication and coordination with our partners, will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with New Hampshire Audubon and other partners to evaluate and manage human (e.g. recreational) influences, and conduct outreach and education as necessary.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Identify historical, active, and potential peregrine falcon nesting sites.
- Coordinate with New Hampshire Audubon and other conservation organizations to conduct spring surveys of identified sites to determine occupancy.
- Work with New Hampshire Audubon and other partners to annually monitor active sites to determine occupancy status and reproductive outcome.

**Sub-objective 1.2c. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Less than one percent of the Mascoma River CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However,

large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct an inventory of pasture, hay and grassland habitats to determine their condition, size and location, and incorporate them into the management strategies for American woodcock in the HMP.

**Sub-objective 1.1d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987; Hunter 1991; Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation

plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Mascoma River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook. Also provide undisturbed breeding, foraging and stopover habitat for American black duck and other waterfowl species.

***Rationale:***
The Mascoma River watershed supports high water quality streams that are pristine with minimal impacts from human influences. The Mascoma River CFA supports numerous minimally developed ponds, perennial and intermittent streams, and river habitats, including the Mascoma River. The brooks and streams in the Mascoma River CFA provides cold water habitat for eastern brook trout, a species of conservation concern for the State and the Service's Northeast Region.

Mudgetts Pond, Larry Pond, and Little Clark Pond are secluded and surrounded by wetlands, and may provide undisturbed breeding, foraging and stopover habitat for a variety of waterfowl species including wood duck, American black duck, Canada goose, mallard, green-winged teal, ring-necked ducks and mergansers. Common loons, a state species of greatest conservation need are known to nest in the Mascoma River CFA.

Management of water resources in the Mascoma CFA will provide clear aquatic species passage to spawning and wintering habitat, structurally diverse instream habitat, with boulders and downed woody debris providing riffles and pools, and shade trees along riparian edges. Open water habitats will remain pristine and undeveloped.

Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent on not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of the water resources in the CFA at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Work with partners to implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate stream and fish community health.
- Work with partners to identify man-made physical barriers (e.g. impassable road crossings, culverts and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Mascoma River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Mascoma River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Mascoma River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Mascoma River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Mascoma River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Mascoma River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Mascoma River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.

- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Mascoma River Division.

- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***

See the rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Mascoma River Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Mascoma River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Mascoma River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience based on state regulations.

***Rationale:***
The Mascoma CFA is a popular area to hunt white-tailed deer, moose, Eastern wild turkey, black bear, and small game. Hunting would be allowed on a newly created division as long as it is found to be a compatible use. Hunting, consistent with the final compatibility determination, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.

  (a) The season for hunting snowshoe hare and coyotes with dogs is from October 1 to March 15.

  (b) Use of bait is prohibited.

  (c) Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

- Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with New Hampshire Fish and Game Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Mascoma River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

- Work with New Hampshire Fish and Game Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Mascoma Division after completing all administrative procedures to officially open refuge lands to fishing, based on New Hampshire Fish and Game Department regulations, and any division-specific conditions.

***Rationale:***
There are several streams in the proposed CFA including the Mascoma River, Tinkhamtown Brook, Indian River, and Call Brook. The Mascoma River supports a cold water fishery with brook trout, brown trout, and rainbow trout. A variety of game fish are found in the other streams of the CFA. Fishing is a popular activity throughout this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The Mascoma Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land with fishable waters:*

- Work with the New Hampshire Fish and Game Department to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. Local organizations such as the Mascoma Chapter of New Hampshire Audubon and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.
- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring sufficient land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring sufficient land:*

- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.

- Encourage local schools and groups such as the Mascoma Chapter of New Hampshire Audubon and other environmental organizations to offer wildlife-centered trips to the refuge.

- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring sufficient land:*
- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Mascoma River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Mascoma River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource. Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*
- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

*Within 5 years of acquiring land containing a section of the Appalachian Trail:*

- Work with the State of New Hampshire, the Appalachian Trail Conservancy, adjacent landowners, and other local interests to explore partnership opportunities related to the trail and the surrounding network of conserved lands in the CPA.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**

Allow compatible outdoor recreational opportunities on the Mascoma River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***

In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**

(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of acquiring sufficient land:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units

# Overview
# Pondicherry Conservation Focus Area (Existing Refuge Division)

## Whitefield, Jefferson, and Carroll, New Hampshire

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 10,242 | 100 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *6,405* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *3,837* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 0 | 0 % |
| Total Acres in CFA[2, 4] | 10,242 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS. [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

### What specific criteria and/or considerations drove the selection of this CFA?

The existing Pondicherry Division was established in 2000 and is now over 10 square miles in area. The CFA includes the State of New Hampshire's first designated IBA, a National Natural Landmark, and two National Recreation Trails. The proposed expansion to the existing division would help better protect the headwaters of Johns River and provide connectivity between White Mountains National Forest and the Pondicherry wetlands complex by connecting the lower elevation wetlands in the CFA to the upland slopes that feed into it.

### What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Conifer Swamp/Spruce-fir – 57.7%
- Peatlands – 6.4%
- Shrub Swamps and Floodplain Forest - 5.1%

For more information about habitats in the CFA, see map A.52 and table A.37.

### What are the resources of conservation concern for the proposed CFA?

As noted in table A.38 below, there are eight Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that rely upon the diverse habitats in this CFA. There are also PRRC habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the potential value of this area to Canada lynx, a federally listed species recently confirmed breeding in northern New Hampshire, and to State Species of Greatest Conservation Need (SGCN).

1. **Federal Threatened and Endangered Species**
   Canada lynx have been confirmed breeding in northeastern New Hampshire by New Hampshire Fish and Game Department, and lynx tracks have been detected near the Pondicherry CFA. Conservation efforts for this species should be done at the landscape scale, and additional information is necessary to evaluate the importance of New Hampshire for Canada lynx and those measures needed to ensure their

persistence within the State. Monitoring lynx presence and use of habitats in the Pondicherry CFA, therefore, is a priority, and coordination with New Hampshire Fish and Game Department will allow for a standardized approach.

A bat acoustic survey in 2013, conducted by the USFWS, detected the presence of little brown bats, a species that is being assessed for candidate status under the ESA. Stationary acoustic equipment were deployed at various locations and habitats of the Pondicherry Division, recording almost 500 little brown bat calls. Other bats detected during this inventory included hoary bat, silver-haired bat, big brown bat and eastern red bat. Little brown bats, and other cave dwelling species, have experienced drastic population declines due to effects from the fungal disease white-nose syndrome.

2. **Migratory Birds**
The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Pondicherry CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat for a diversity of bird species.

The importance of Pondicherry to birds has been officially recognized several times. In 1963, New Hampshire Audubon and the New Hampshire Fish and Game Department collaborated to establish the Pondicherry Wildlife Sanctuary, comprised of Cherry and Little Cherry ponds and 166 acres of shoreline. The National Park Service recognized Pondicherry in 1972 for its "…relatively stable bog-forest supporting an unusual variety of birdlife" by naming it a National Natural Landmark. In 2003 the Division and the adjacent Mount Washington Regional Airport were designated the first Important Bird Area in New Hampshire.

The complex ecosystem of bogs, ponds, streams and wetlands surrounded by spruce and fir boreal forests supports approximately 238 species of birds, of which 129 species have been confirmed as breeding. Five years of breeding landbird survey data, and countless observations made by expert birders have detected numerous species of high conservation concern. Many of these species are resident and migratory boreal species including boreal chickadee, black-backed woodpecker, spruce grouse, gray jay, bay-breasted warbler, rusty blackbird, blackpoll warbler, and olive-sided flycatcher. The contiguous forests also provide habitat for forest interior species such as Canada warbler, ovenbird, blackburnian warbler, black-throated blue warbler, and black-throated green warbler. Blackburnian warbler, Canada warbler and black-throated blue warbler are PRRC species that require different species composition and structure within a mature forest. While American woodcock and rusty blackbird, also PRRC species, rely on early successional forests in the CFA.

The secluded ponds and associated wetlands in the CFA provide habitat for various waterbirds including Virginia rail, great blue heron, and American bittern. Cherry Pond is also one of the State's key common loon territories, fledging an average of one chick per year per pair.

3. **Waterfowl**
Cherry and Little Cherry Pond, and associated wetlands provide important breeding and foraging habitat for American black duck, a PRRC species, and other waterfowl species such as ring-necked duck, wood duck, hooded mergansers, and green-winged teal. Cherry Pond and Little Cherry Pond are also staging areas for migrating waterfowl, including scaup, bufflehead, gadwall, scoters, and goldeneye.

4. **Diadromous fish and other aquatic species**
Open water habitats in the Pondicherry CFA are limited to Cherry Pond, Little Cherry Pond, Mud Pond, the John's River and its tributaries, and Stanley Brook. These habitats support several fish species one of which, the Eastern brook trout, is a PRRC and has been identified as a conservation priority for the Service's Northeast Region. Brook trout are found in cold headwater rivers and streams. Wild brook trout have been documented within the CFA, and many streams, including Carroll Stream, are suitable to be managed as a self-sustaining wild brook trout population. Other species documented from Pondicherry

include chain pickerel and several perch species from Cherry Pond, and state species of concern including burbot (cusk), northern redbelly dace, slimy sculpin, and tessellated darter from riverine habitats.

5. **Wetlands**
The Pondicherry CFA lies about 1,110 feet above sea-level in a three-sided basin, surrounded to the north, east, and south-by peaks rising from 5,000 feet (Pliny Range) to 5,580 feet (Presidential Range) above the basin. It is not surprising that more than seven percent of the CFA consists of wetland habitats. About 537 acres of shrub swamp and floodplain forest, and 667 acres of peatlands make up the majority of the wetland habitat. These wetlands are concentrated along the perimeter of Cherry and Little Cherry Ponds, and the John's River.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and management actions will aim to maintain forest types and structures appropriate for to site conditions and location (i.e. soils and aspect). Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (stream, rivers, and ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse in-stream habitat, and unimpeded aquatic species passage to spawning and wintering habitat.

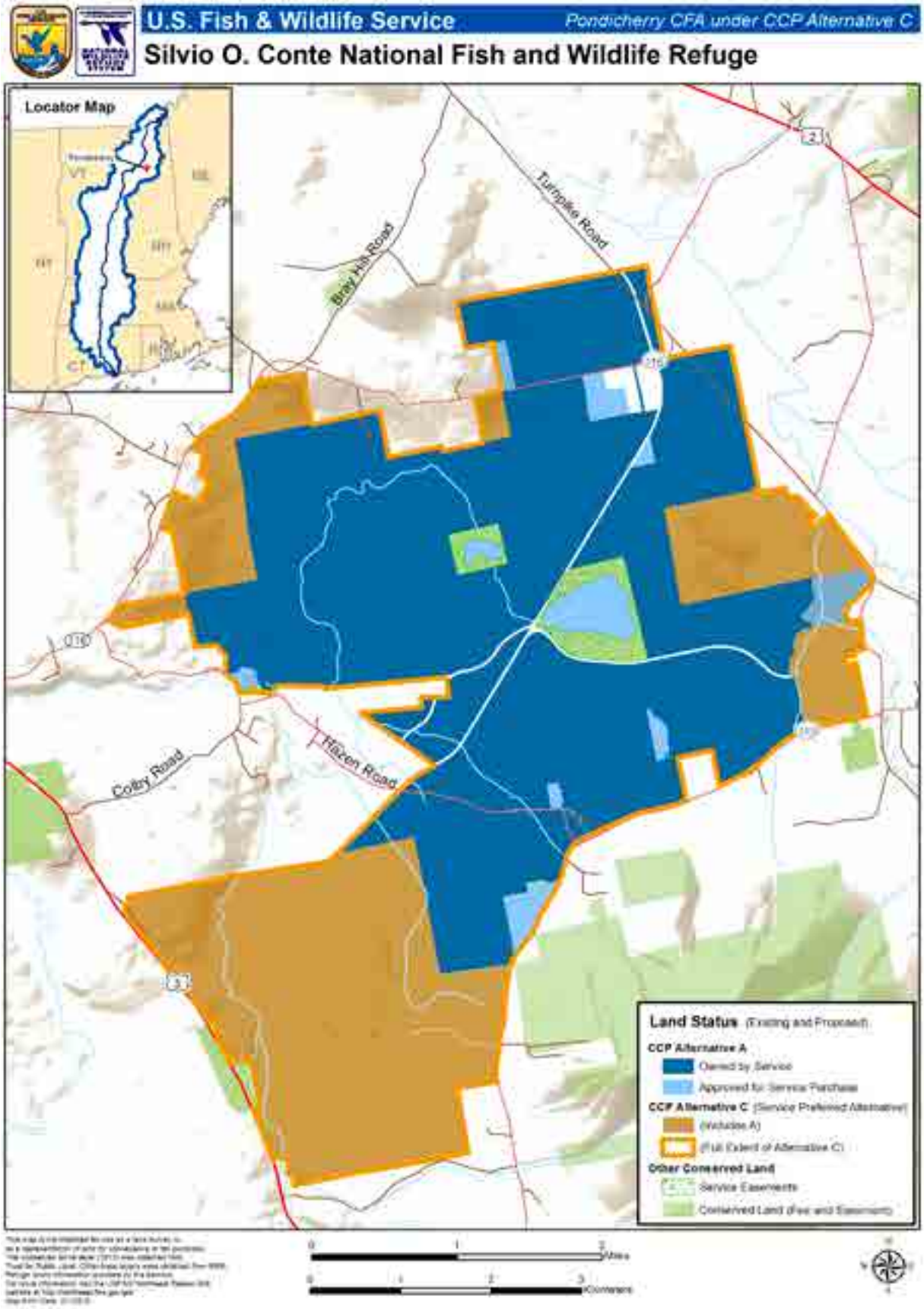
## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

Our priority would be providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation. See map A.49 for more information on proposed additional public use infrastructure.

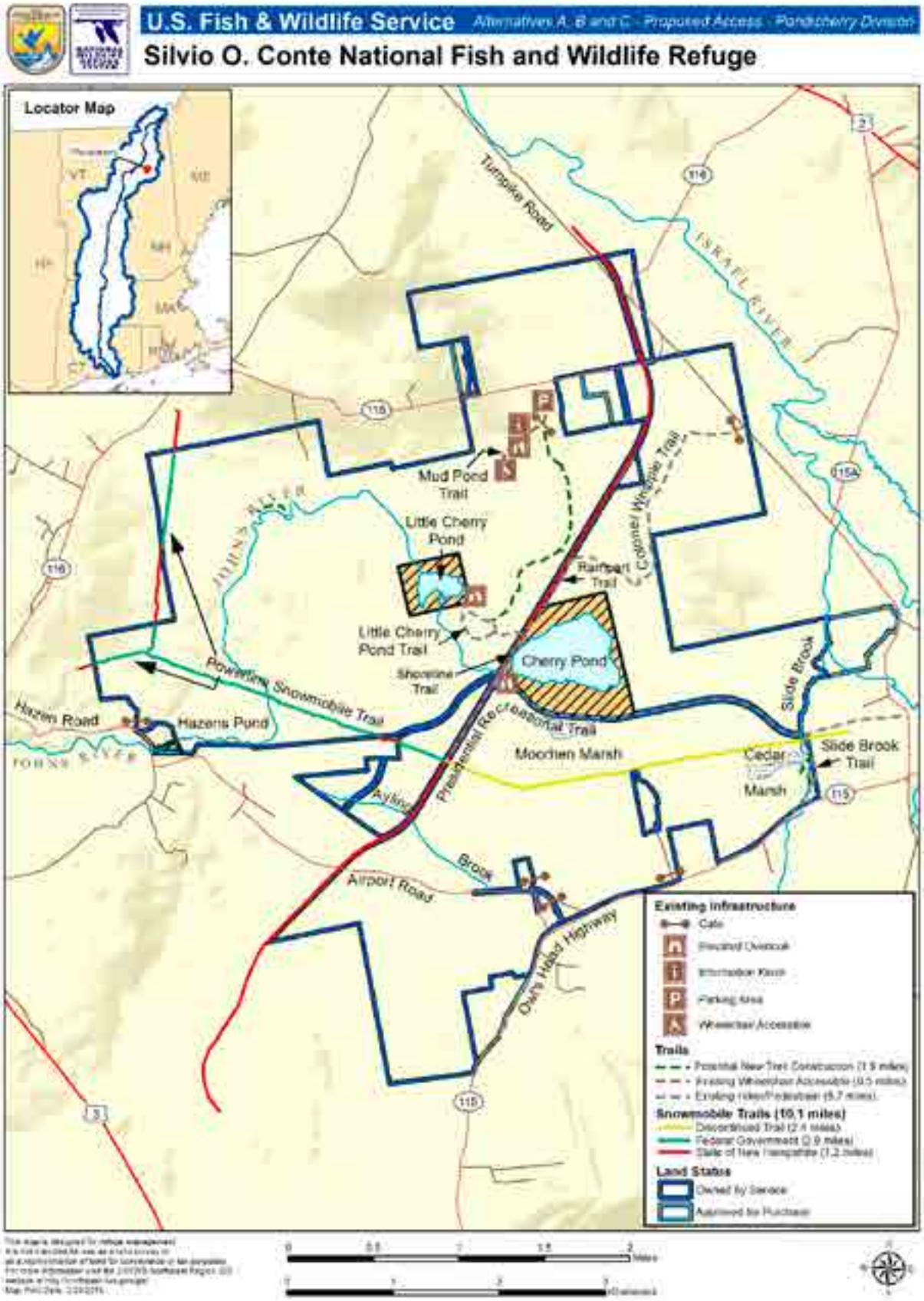
## Were there other special considerations in delineating the CFA boundary?

In 1974, land within the basin also was recognized as a National Natural Landmark by the National Park Service. In 2003, the Pondicherry Division was designated as the State's first Important Bird Area--an international program which uses scientific criteria to identify habitat important to birds.

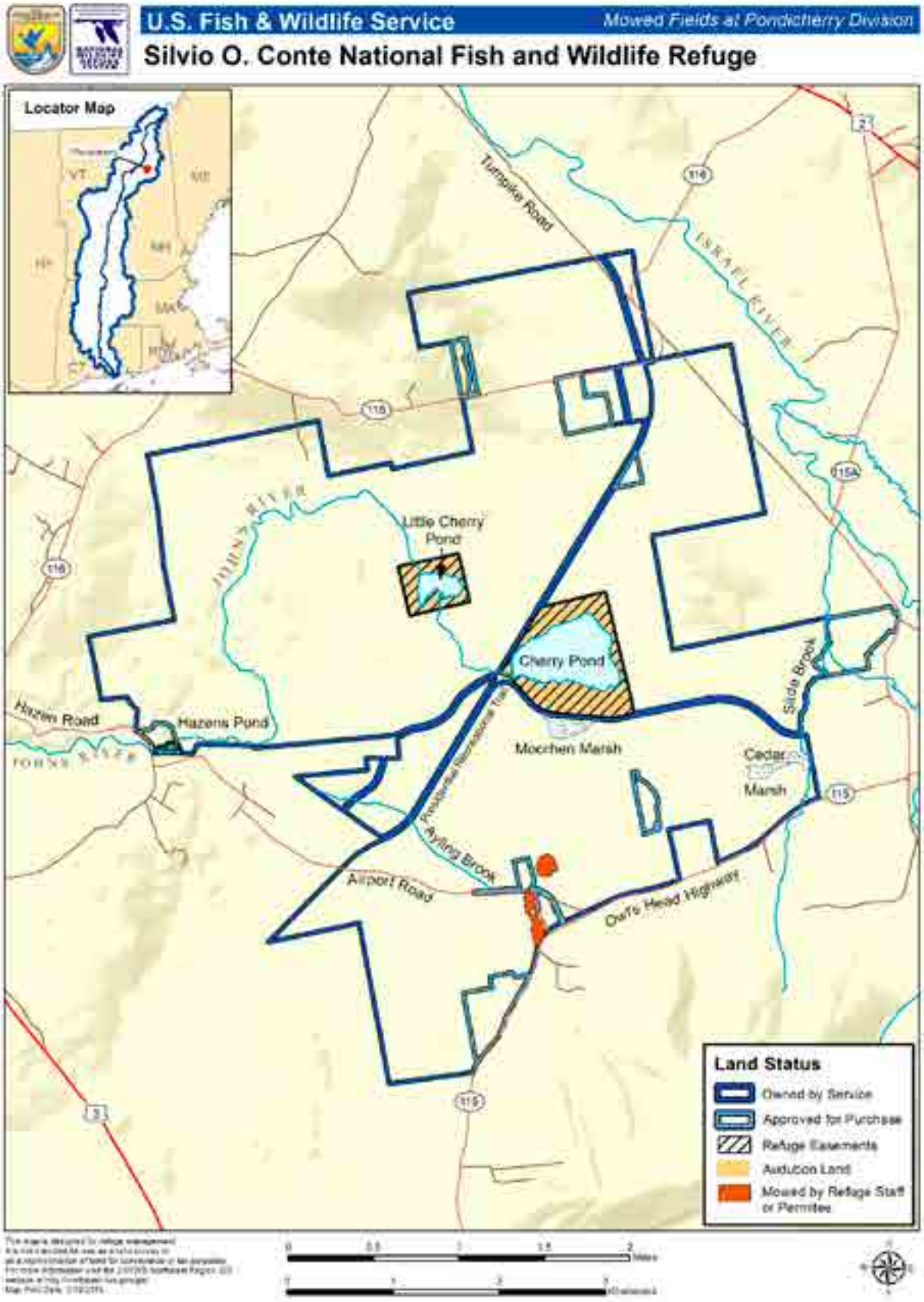
*Map A.48. Pondicherry CFA – Location.*



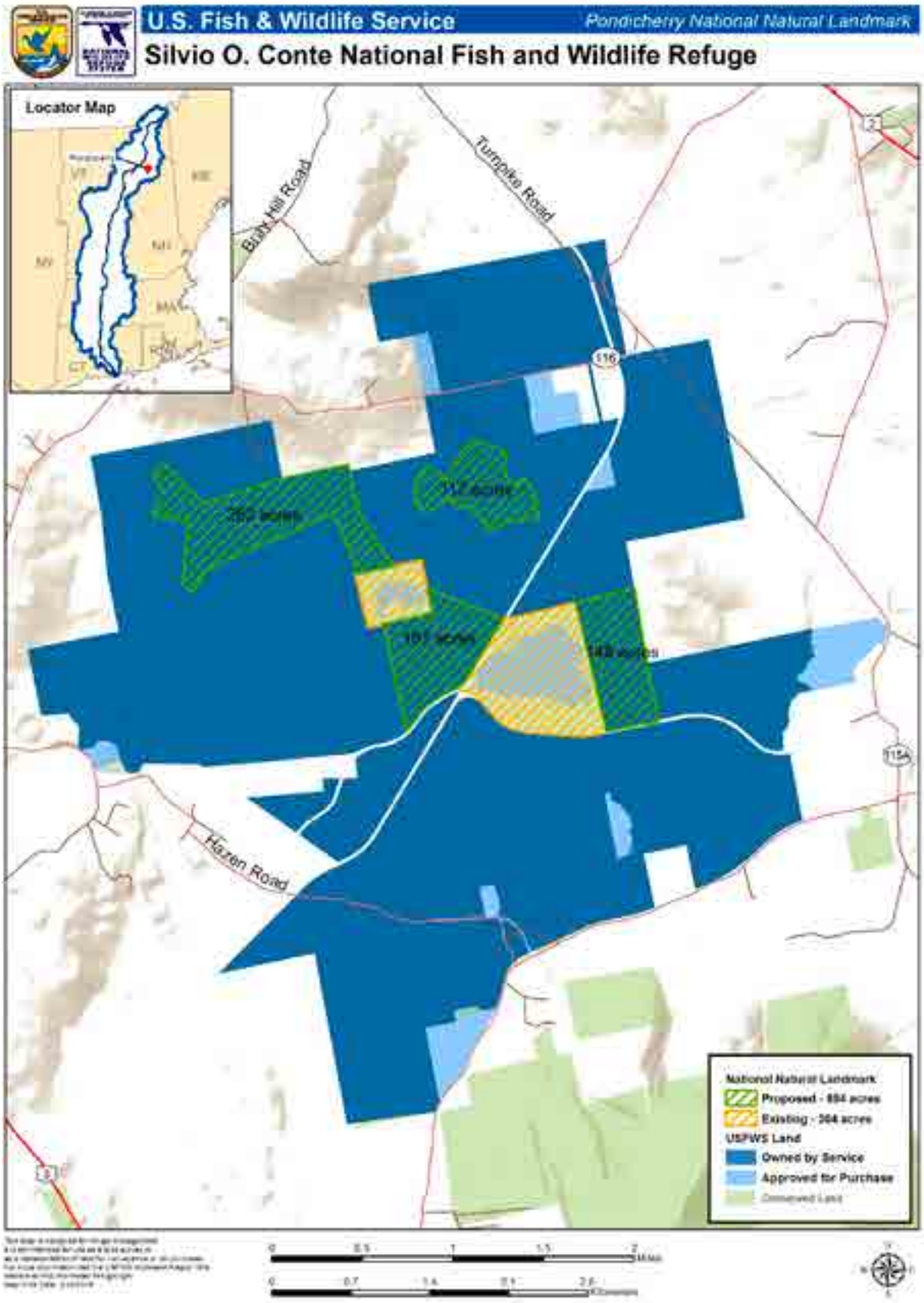
*Map A.49. Pondicherry CFA – Proposed Public Access.*



*Map A.50. Pondicherry CFA – Fields Mowed and Hayed.*



*Map A.51. Pondicherry CFA – Proposed Expansion to National Natural Landmark.*



*Map A.52. Pondicherry CPA/CFA – Habitat Types.*

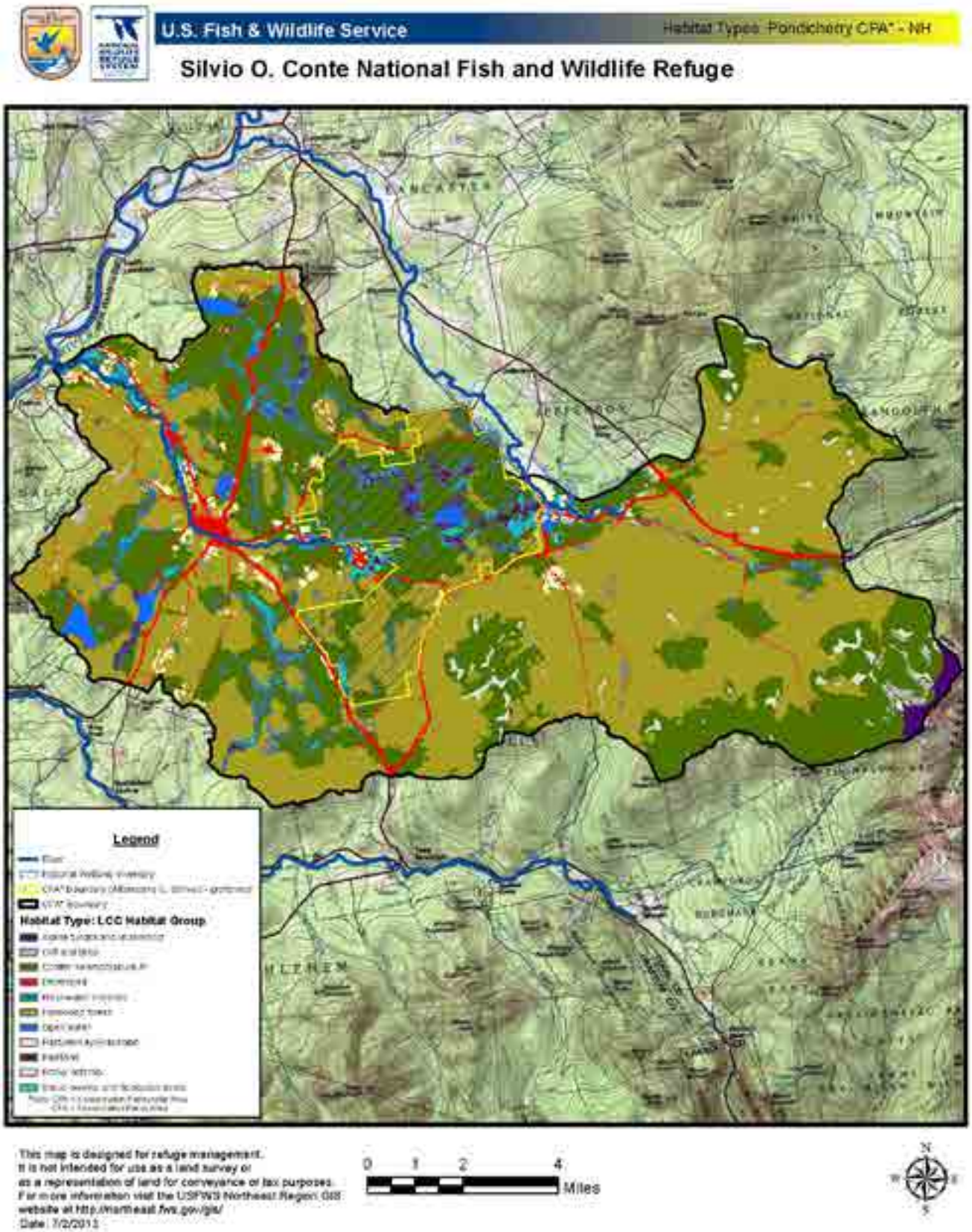


**Table A.37. Pondicherry CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 31,662 | 37.4% | 6,056 | 6 | 4,297 | 57.7% | 19.1% |
| Hardwood forest | 41,941 | 49.6% | 2,827 | 9 | 996 | 26.9% | 6.7% |
| Shrub swamp and floodplain forest | 1,799 | 2.1% | 537 | 0 | 353 | 5.1% | 29.8% |
| *Forested uplands and wetlands subtotal* | *75,403* | *89.1%* | *9,420* | *14* | *5,646* | *89.7%* | *12.5%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Alpine tundra and krummholz | 402 | 0.5% | 0 | 0 | 0 | 0.0% | 0.0% |
| Cliff and talus | 312 | 0.4% | 0 | 0 | 0 | 0.0% | 0.0% |
| Freshwater marshes | 387 | 0.5% | 66 | 2 | 38 | 0.6% | 17.0% |
| Pasture/hay/grassland | 1,752 | 2.1% | 49 | 1 | 28 | 0.5% | 2.8% |
| Peatland | 1,027 | 1.2% | 667 | 0 | 578 | 6.4% | 65.0% |
| Rocky outcrop | 1,151 | 1.4% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *5,030* | *5.9%* | *782* | *3* | *643* | *7.4%* | *15.5%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 786 | 0.9% | 136 | 0 | 10 | 1.3% | 17.3% |
| *Inland aquatic habitats subtotal* | *786* | *0.9%* | *136* | *0* | *10* | *1.3%* | *17.3%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Other** | | | | | | | |
| Developed | 3,372 | 4.0% | 163 | 0 | 90 | 1.6% | 4.8% |
| *Other subtotal* | *3,372* | *4.0%* | *163* | *0* | *90* | *1.6%* | *4.8%* |
| **TOTAL** | **84,591** | **100.0%** | **10,501** | **17** | **6,390** | **100.0%** | **12.4%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.38. Pondicherry CFA – Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp/Spruce-fir Forest[5] - 6,056 acres** | | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | Cape May Warbler[A, J]<br>Boreal Chickadee[A, J]<br>Northern Parula[A]<br>Purple Finch[A, J]<br>Black-throated Green Warbler[A, J]<br>**Spruce Grouse [A, I]**<br>**American Marten[I]**<br>Canada Lynx[I, J]<br>Gray Jay[A, I, J]<br>Black-backed Woodpecker [A, I, J]<br>Bay-breasted Warbler[A, I, J]<br>**White-throated Sparrow**<br>**Blackpoll Warbler[A, I]**<br>Brown Creeper[J]<br>Northern Saw-whet Owl[J]<br>Olive-sided Flycatcher[A, I, J]<br>Palm Warbler[A,J]<br>Pine Grosbeak[A, J]<br>Sharp-shinned Hawk[J]<br>Yellow-bellied Flycatcher[J] |
| Rusty Blackbird[A, C] | Breeding habitat includes conifer dominated forested wetlands interspersed with shrub swamps and peatlands. Young spruce and fir may be required for nesting (Greenland et al, 2010, Powell et al., 2010, and Matsuoka et al, 2010). | |
| Little Brown Bat[E] | Feeding areas include wetlands, riparian habitat and open water. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, and Darling Guidelines, unpublished). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft. within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20’ in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 2,827 acres** | | |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | **Ruffed Grouse[A, I]**<br>Whip-poor-will[A, I, J]<br>Smooth Green Snake[I]<br>Canada Lynx[I]<br>**Chestnut-sided Warbler[A, I]**<br>**Ovenbird[A]**<br>**Eastern Red Bat[I]**<br>Northern Parula[A]<br>American Redstart[A, J]<br>Black-and-white Warbler[J]<br>Black-throated Green Warbler[A]<br>Eastern Wood-pewee[A, J]<br>Northern Flicker[A, J]<br>Northern Goshawk[A, I, J]<br>Red-shouldered Hawk[I, J]<br>Sharp-shinned Hawk[J]<br>Yellow-bellied Sapsucker[A, J]<br>Purple Finch[A,I]<br>Veery[A] |
| Black-throated Blue Warbler[A] | Breeding habitat includes mature deciduous and mixed deciduous/conifer forests with a shrubby understory (Degraaf et al. 2001, Hodgman et al. 2000, Dobbs 2007, Dunn et al. 1997) | |
| Little Brown Bat[E] | Feeding areas include wetlands, riparian habitat and open water. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, and Darling Guidelines, unpublished). | |
| **Blackburnian Warbler[A]** | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 537 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands, and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | Chestnut-sided Warbler[A,I]<br>Great Blue Heron[I]<br>American Redstart[A,J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>Wood Duck[A,J]<br>**Warbling Vireo**<br>**Willow Flycatcher**<br>Canada Goose[A]<br>Northern Leopard Frog[I]<br>Smooth Green Snake[I]<br>Veery[A]<br>Ruffed Grouse[A,I] |
| Little Brown Bat[E] | Feeding areas include wetlands, riparian habitat and open water. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, and Darling Guidelines, unpublished). | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 66 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **American Bittern[A,I]**<br>**Marsh Wren**<br>**Virginia Rail**<br>Northern Harrier[A,I,J]<br>Common Moorhen[I]<br>Canada Goose[A]<br>Wood Duck[A]<br>Hooded Merganser[J]<br>Green-winged Teal[J]<br>Mallard[J]<br>Great Blue Heron[I]<br>Common Loon[A,I] |
| **Pasture/Hay/Grassland[5] – 49 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[J]<br>Northern Harrier[A,I,J]<br>Chestnut-sided Warbler[A,I]<br>**Bobolink[A]**<br>**Grasshopper Sparrow[I]**<br>**Eastern Meadowlark[I]** |
| **Peatland [5] – 667 acres** | | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Olive-sided Flycatcher[A, I, J]<br>**Mink Frog[I]**<br>**Palm Warbler[A]**<br>Black-backed Woodpecker[A, I, J]<br>Northern Harrier[A, I, J]<br>Eastern Kingbird[J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 136 acres** | | |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Northern Redbelly Dace[I]<br>**Slimy Sculpin[I]**<br>Tessellated Darter[I] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Canada Goose[A]<br>Wood Duck[A]<br>Hooded Merganser[J]<br>Green-winged Teal[J]<br>Mallard[J]<br>Great Blue Heron[I]<br>**Common Merganser**<br>**Ring-necked Duck**<br>**Common Loon[A,I]** |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2006 New Hampshire Wildlife Action Plan (Species of Greatest Concern)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Pondicherry CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including black-throated blue warbler, little brown bat, American woodcock, and blackburnian warbler.

***Rationale:***
This large, contiguous block of matrix forest has been identified as a conservation priority by a host of partners including the State of New Hampshire's Wildlife Action Plan, the Nature Conservancy's Lower New England-Northern Piedmont Ecoregional Plan, and Audubon has designated Pondicherry as an Important Bird Area.

In 1974, land within the basin was recognized as a National Natural Landmark (NNL) by the U.S. National Park Service. Its significance is that it is an exemplary example of an undisturbed boreal forest community that supports an unusually high diversity of birdlife and wetland communities. With additional acquisition of exemplary wetlands in the Pondicherry Division, we are proposing an expansion to this NNL designation. In chapter 4 under "Actions Common to All Alternatives," we describe our proposal and include a map of the existing NNL and its expansion.

In 2003, the Pondicherry Division was designated as the state's first Important Bird Area--an international program which uses scientific criteria to identify habitat important to birds. Its complex ecosystem of bogs, ponds, streams, and wetlands surrounded by spruce and fir boreal forests supports approximately 238 species of birds, of which 129 species have been confirmed as breeding. Following its designation as an important bird area, the Division was expanded by 3,010 acres purchased from Hancock Timber Resource Group.

We envision healthy forests within the Pondicherry CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of New Hampshire's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011). Pondicherry CFA's hardwood forests have long been recognized as being among the most diverse and productive for wildlife, and abundant, high-quality habitat is most certainly available within the CFA. To date, our review of Pondicherry's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, a coarse-scale habitat inventory, and an understanding of forest disturbance and land-use history within the CFA. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Pondicherry comes from a forest-based habitat inventory conducted in 2007 (USFWS, unpublished), and a reading of the recent forest history within the Pondicherry basin—a legacy of intensive past-use has altered the vegetation structure and composition, landscape patterns, and potentially ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective addresses the current hardwood forest condition of Pondicherry which are remarkably more homogeneous than those of three centuries earlier, and species compositions include more sprouting and shade-intolerant species and fewer long-lived mature forest tree

species (USFWS, unpublished). Completing a finer-scale comprehensive forest and habitat inventory will aid in identifying stands where a forest management approach combining passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. Much of the hardwood forest within the Pondicherry CFA was harvested prior to refuge ownership using techniques that produced a structurally homogenous, young forest landscape. While our management goals may create a relatively old forest, hardwood forests within Pondicherry will contain a variety of patches in different age classes and developmental stages; it will not be uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, bald eagles, and—if wetlands and riparian areas are present—Canada warbler (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009).

The structural homogeneity of hardwood forests in Pondicherry has limited important habitat features for refuge priority resources of concern. Pondicherry's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0 to 5 feet in height) are of particular importance. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like black-throated blue warbler and blackburnian warbler. Black-throated blue warbler nest and feed within the shrub layer level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Rosenberg et al. 1999). And blackburnian warbler has significance as a NALCC representative species for hardwood forests in the NALCC northern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who are thought to be strongly associated with the mixed-wood forests within Pondicherry.

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and northern goshawk.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are largely absent or are very few in the younger forests that characterize Pondicherry, and that has implications for wildlife habitats and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near open bodies of water, are utilized by bald eagles. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that use large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Cavity trees may also be used by little brown bats as roosting sites. Female little brown bats raise pups in large maternity colonies within buildings or cavity trees often near wetlands or open water. Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Continue to manage invasive plant species.
- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Identify forest stands where soils and species composition will support woodcock management
- Work with partners, including the State of New Hampshire, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Retain cavity trees within the vicinity of open water and wetlands to provide maternity sites for little brown bats. Protect bat maternity roosts, if present.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Map natural communities; protect rare or exemplary examples.
- Conduct forest inventories.
- Continue to survey wildlife use including breeding landbirds and bat inventories.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Conifer Swamp/Spruce-fir)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve landscape connectivity of spruce-fir habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including blackburnian warbler, rusty blackbird, little brown bat and Canada warbler.

***Rationale:***
The spruce-fir forests of Pondicherry have long been recognized for their diverse mix of habitats centered on lowland spruce-fir forests and associated wetlands. Conservation plans including the State of New Hampshire's Wildlife Action Plan and the Nature Conservancy's Lower New England-Northern Piedmont Ecoregional Plan have targeted Pondicherry. In 2003, the Pondicherry Division was designated as the state's first Important Bird Area—an international program which uses scientific criteria to identify habitat important to birds. The CFA supports a complex ecosystem of bogs, ponds, streams and wetlands surrounded by spruce and fir boreal forests supports approximately 238 species of birds, of which 129 species have been confirmed as breeding. We envision healthy spruce-fir forests within the Pondicherry CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of New Hampshire's wildlife.

Our long-term vision for the CFA includes spruce-fir mosaic forests characterized by complex horizontal and vertical structure, a generally closed canopy, larger-diameter trees, dead woody material, snags and cavity trees, native species diversity, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011). Historically, this habitat type was a mosaic of lowland spruce-fir forest and red spruce swamp communities that occur on mineral soils. In the Pondicherry CFA, these communities intergrade in complex ways on the ground, with various expressions ranging from red spruce swamps with either an abrupt transition to a narrow spruce—fir forest border or direct transition to hardwood forest. Lowland spruce—fir forests generally have a well-developed conifer canopy, a sparse tall shrub understory, sparse to moderate cover of ferns and dwarf shrubs, and moderate to high cover of bryophytes.

To date, our review of Pondicherry's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, a coarse-scale habitat inventory, and an understanding of forest disturbance and land-use history within the CFA. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Pondicherry comes from a forest-based habitat inventory conducted in 2007 (USFWS, unpublished), and a reading of the recent forest history within the Pondicherry basin—a legacy of intensive past-use has altered the vegetation structure and composition, landscape patterns, and potentially ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, 2002, Bellemare et al. 2002). In this habitat, heavy disturbance prior to refuge ownership resulted in hardwood-softwood mixtures with a predominance of balsam fir and a paucity of red spruce. Our sub-objective addresses the current spruce-fir forest condition of Pondicherry: remarkably more structurally homogeneous than those of three centuries earlier, with a preponderance of young forest with low species diversity (USFWS, unpublished). Completing a finer-scale comprehensive forest and habitat inventory will aid in identifying stands where a forest management approach combining passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. Much of the spruce-fir forest within the Pondicherry CFA was harvested prior to refuge ownership using techniques that produced a structurally homogenous, young forest landscape. While our management goals may create a relatively old forest, spruce-fir forests within Pondicherry will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like rusty blackbird, are declining as remaining patches of young forest mature (Matsuoka et al. 2010, Powell et al. 2010) (R. Cliche personal communication). Across the CFA, enhanced horizontal structure should support other species of conservation concern like bobcat, spruce grouse, and—if wetlands and riparian areas are present—Canada warbler (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009).

The structural homogeneity of spruce-fir forests in Pondicherry has limited important habitat features for refuge priority resources of concern. Pondicherry's spruce-fir forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance. These habitat elements may have importance to declining forest species identified in regional conservation plans like rusty blackbird and blackburnian warbler. Rusty blackbirds are thought to use younger softwood along riparian areas and open wetlands within spruce-fir forested wetlands in the CFA. Disturbances such as beaver activity and windthrow create forest openings allowing softwood regeneration and potential rusty blackbird habitat (Avery 1995). Blackburnian warbler has significance as a NALCC representative species for hardwood forests in the NALCC northern sub-region. Blackburnian warblers use mature conifer forests of spruce, fir, hemlock, and pines, and mixed wood habitats including deciduous stands with patches of conifer (Morse 1994, Dunn and Garrett 1997, DeGraaf and Yamasaki 2001). Improving vertical diversity of spruce-fir forests during management may provide an important habitat component for blackburnian warblers, who are canopy foragers who preferentially breed in forests with substantial cover taller than 60 feet (Morse 1976).

Canada warbler, a priority refuge resource of concern, occupies this habitat with high densities occurring in mixed forested swamps (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009).

Canada lynx, a federal listed species, will also benefit from our forest management. Canada lynx have been confirmed breeding in northeastern New Hampshire by NH Fish and Game Department, and lynx tracks have been detected near the Pondicherry CFA. Canada lynx require boreal forests that contain a mosaic of early successional and mature forests. Snowshoe hare is their primary food source, and hare density is considered the most important factor in explaining lynx distribution. It is generally believed that at least 0.2 hares per acre are required to support breeding populations of Canada lynx (Ruggiero et al. 1999). A mature forest with abundant coarse woody debris, such as downed trees and root wads are used by lynx for denning habitat. Snow conditions that are deep and fluffy for extended periods of time are thought to favor lynx, providing a competitive edge over bobcats, their principal competitor. Large contiguous tracts of boreal forests with these habitat conditions will facilitate movement between areas of high snowshoe hare abundance within established home ranges.

Monitoring lynx use of habitats in the Pondicherry CFA is a priority, and coordination with New Hampshire Fish and Game Department will allow for a standardized approach. To ensure that Canada lynx persist in the state, it is important that efforts to conserve the species be developed at a landscape scale, since no single landowner is likely to support enough habitat for this species. Collaboration with key partners will be necessary, including adjacent landowners, New England Field Office, the New Hampshire Fish and Game Department and Vermont Fish and Wildlife Department, to develop a lynx conservation plan for northern New Hampshire and neighboring Vermont.

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like black-throated green warblers. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of wildlife species that include: spruce grouse, white-throated sparrow, American marten, denning Canada lynx, and white-tailed deer.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (20 inches or greater dbh) trees where appropriate. Such larger trees are largely absent or are very few in the younger forests that characterize Pondicherry, and that has implications for wildlife habitats and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the sharp-shinned hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near open bodies of water, are utilized by bald eagles. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that use large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Cavity trees may also be used by little brown bats as roosting sites. Female little brown bats raise pups in large maternity colonies within buildings or cavity trees often near wetlands or open water. Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, northern saw-whet owls, and black-backed woodpecker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Continue to manage invasive plant species.

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Identify forest stands where soils and species composition will support woodcock management.
- Ensure this habitat type provides effective winter shelter for white-tailed deer, consistent with management of refuge resources of concern.
- Evaluate hydrologic regime to inform restoration efforts.
- Work with partners, including the State of New Hampshire, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.
- Work with partners and the USFWS New England Field Office to develop a lynx management plan for northern Vermont and New Hampshire, and evaluate the importance and role of habitats in the Pondicherry CFA to lynx populations in the southern boreal forest.

*Within 10 years of CCP approval:*

- Implement identified active forest management opportunities by using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Where appropriate, emulate the natural disturbance regime inherent to the forest types within this broad habitat type and work within the confines of seral pathways dictated by soil, climate, and hydrology.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Promote stands dominated by early seral stages where appropriate to support nesting Canada warbler and rusty blackbirds.
- Promote stands dominated by late seral stages in the CFA interior to support blackburnian warbler.
- Retain cavity trees within the vicinity of open water and wetlands to provide maternity sites for little brown bats. Protect current bat maternity roosts, if present.

**Inventory and Monitoring Strategies:**

*Within 5 years of CCP approval:*

- Conduct forest inventories.
- Continue to survey wildlife use including breeding landbirds and bat inventories
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.
- Monitor Canada lynx populations.

**Sub-objective 1.1d. (Shrub Swamps and Floodplain Forest)**

Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide breeding and foraging habitat for priority refuge resources of concern including American woodcock, little brown bat and American black duck.

***Rationale:***

Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008).

These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock, little brown bat and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of a woodcock management area. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation, and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests near foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14.

Little brown bat, a species being assessed for candidate status under the ESA, feeds over CFA wetland and open water habitat where insect populations are abundant. Bats use echolocation for navigation and to locate prey. Rivers and streams in the CFA are used as travel corridors between suitable habitats. Little brown bats use buildings or tree cavities for summer roost sites, often near open water. Females will roost in large maternity colonies to raise young. Pondicherry CFA is an important feeding area for these bats, which have experienced drastic population declines due to the effects of the fungal disease known as white-nose syndrome.

Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of refuge priority resources, and other species that use CFA wetlands.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Create and maintain alder in suitable density and age class to provide quality foraging habitat for American woodcock.
- Manage non-native plant species.
- Map natural communities and protect rare or exemplary examples.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Assess hydrology of wetland communities, evaluate impacts, and prioritize restoration opportunities.
- Monitor American black duck productivity, and use of shrub wetlands.

- Continue to inventory bat populations throughout the CFA to better understand species presence and locate areas with concentrated detections. Investigate areas with high bat activity to determine if maternity roosts are present. Manage and protect maternity roosts if present.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh and Peatlands)**
Manage freshwater marsh and peatland communities to support natural and rare ecological communities, and provide breeding and foraging habitat for priority refuge resources of concern including American black duck, and undisturbed staging areas for migrating waterfowl.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams. The substrate in peatland communities is dominated by sphagnum moss, and the vegetation can be semi-treed or dominated by low shrubs, such as sheep laurel and Labrador tea. Sedges and grasses are common in the understory (Gawler 2008).

Freshwater marshes and peatlands are scattered throughout the CFA, but are concentrated along the perimeter of Cherry and Little Cherry ponds. This wetland complex, adjacent to open water habitat, provides important breeding and foraging habitat for American black duck, and other waterfowl species such as ring-necked duck, wood duck, hooded mergansers, and green-winged teal. Cherry Pond is also a key common loon territory in the state, fledging an average of one chick per year per pair. Cherry Pond and Little Cherry Pond are also staging areas for migrating waterfowl, including scaup, bufflehead, gadwall, scoters, and goldeneye. Conservation efforts will focus on maintaining native herbaceous vegetation, and minimizing disturbances during the breeding and migration periods.

**Management Strategies:**
*Within 5 years of CCP approval:*
- Minimize refuge activities that disturb wetland communities.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Map natural communities; protect rare or exemplary examples.
- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Continue to survey wildlife use of wetlands.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
Less than one percent of the Pondicherry CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing “old field” habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct an inventory of pasture, hay, and grassland habitats to determine their condition, size and location, and incorporate them into the management strategies for American woodcock in the HMP.

- Conduct further investigation on the pasture, hay and grassland habitats that will not be managed for woodcock to determine their importance to other wildlife and contribution to habitat diversity in the landscape.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and uninterrupted aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout. Also provide undisturbed areas for breeding and migrating waterfowl.

***Rationale:***
Open water habitats in the Pondicherry CFA are limited to Cherry Pond, Little Cherry Pond, Mud Pond, Moorhen Marsh, Cedar Marsh, the John's River and its tributaries, and Stanley Brook. These habitats support several fish species one of which, the Eastern brook trout, has been identified as a conservation priority for the Service's Northeast Region. Brook trout are found in cold headwater rivers and streams. They are sensitive to extreme temperature fluctuations, and require water temperatures between 40 to 70 degrees Fahrenheit for spawning, growth, and survival. Wild brook trout have been documented within the CFA, and many streams, including Carroll Stream, are suitable to be managed as a self-sustaining wild brook trout population. Other species documented from Pondicherry include chain pickerel and several perch species from Cherry Pond, and state species of concern including burbot (cusk), northern redbelly dace, slimy sculpin, and tessellated darter from riverine habitats.

Cherry and Little Cherry ponds, and associated wetlands provide important breeding and foraging habitat for American black duck, and other waterfowl species such as ring-necked duck, wood duck, hooded mergansers, and green-winged teal. Cherry Pond is also one of the State's key common loon territories, fledging an average of one chick per year per pair. Cherry Pond and Little Cherry Pond are also staging areas for migrating waterfowl, including scaup, bufflehead, gadwall, scoters, and goldeneye. Conservation efforts will focus on minimizing disturbances during the breeding and migration periods.

Management of water resources in the Pondicherry CFA will provide unimpeded aquatic species passage to spawning and wintering habitat, structurally diverse in-stream habitat, with boulders and downed woody debris providing riffles and pools, and shade trees along riparian edges. Due to our lack of knowledge regarding aquatic habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Baseline information on the condition of the water resources in the CFA at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct stream assessments to evaluate the physical, chemical, and biological condition of the Pondicherry Division's fish community structure, productivity, and health.
- Conduct stream assessments to identify man-made physical barriers (e.g., impassable road crossings, culverts, and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
In coordination with our Friends group, act as a resource to communities, school systems, public and non-profit organizations, and private educational organizations in northeastern Vermont and northern New Hampshire, who want to use the Pondicherry Division as an outdoor environmental education classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed. Because the Pondicherry Division does not have a facility or full time staff, environmental education efforts will generally be conducted through volunteers, Friends members, and partners.

**Management Strategies:**
*Continue to:*

- Make the division available as an outdoor environmental classroom to schools and organizations.

*Within 5 years of CCP approval:*

- Promote the Pondicherry Division as a destination for field trips and increase the number of students by two percent per year for the next 5 years.
- Encourage and support Friends group to work with local schools to develop experiential learning programs focusing on Northern hardwood and spruce-fir forests, wetlands, and migratory birds that contribute to NH curriculum standards.
- Encourage and support the Friends group to develop an educational partnership with the White Mountain Regional School District, the White Mountain School, and other local schools to use the division as an outdoor classroom emphasizing the ecology of Northern hardwood and spruce-fir forests, wetlands, and migratory birds.
- Make environmental education training conducted in other parts of the refuge available to volunteers and Friends group members.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop an evaluation system to assess the effectiveness of all environmental education programs.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Promote other government agencies, non-profit organizations, private educational organizations, staff, volunteers, and members of the Friends of Pondicherry to offer high quality environmental education programs at the Pondicherry Division.

***Rationale:***
See the rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Use volunteers and members of Friends group to facilitate teachers and students at the Pondicherry Division.
- Work with local environmental education providers to implement the refuge's Adopt-a-Habitat initiative to help schools and individuals learn about and connect with natural features their local environments.
- Work with Friends of Conte Recreation and Education sub-committee to support and recruit partners that seek funding for watershed-based environmental education.
- Work with Friends to develop and provide educational programs on how to detect and report invasive species, such as invasive plants, pathogens, insect pests, fish, and other animals.
- Encourage partners to develop an evaluation system to measure the effectiveness of environmental education programs.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
Encourage and support Friends group to work with communities, public and non-profit organizations, staff, and volunteers to offer quality interpretive programming at the Pondicherry Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail on site, the Pondicherry Division is well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the habitats and cultural resources found on the Pondicherry property.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with Friends group to employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.
- Collaborate with Friends group and volunteers to create meaningful, consistent, thematic statements to be used in the delivery of programming at the Pondicherry Division.
- Develop more detailed interpretive objectives and strategies as part of a Visitor Services Plan.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members and the general public, with priority given to refuge affiliates.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through Friends group, annually provide quality interpretive programs, exhibits, printed media at the Pondicherry Division.
- Initiate a "refuge host" program, or utilize SCA interns and volunteers to provide personal contacts at the refuge to initiate discussion and answer questions, at least between Memorial Day and Labor Day.

- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of CCP approval*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Pondicherry Division is unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Pondicherry Division is unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation.** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below. The area around Cherry Pond, Little Cherry Pond and the corridor between the two ponds on which the Service holds a management easement will remain closed to hunting complying with the wishes of the landowner and avoiding conflicts in an area popular with hikers, bird watchers, photographers, etc.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. Pondicherry has been a popular area with hunters, particularly for ruffed grouse, snowshoe hare, and white-tailed deer for many years prior to acquisition by the Service. The division is currently open to hunting except for Cherry and Little Cherry ponds, lands connecting the ponds, and the lands immediately adjacent to the ponds. This area has been closed to hunting since the early 1960s when the original preserve was established by the State of New Hampshire and New Hampshire Audubon. The State has jurisdiction over both large ponds because they are Great Ponds (i.e., water bodies at least 10 acres in size that are held by the State in trust for the people of New Hampshire), and New Hampshire Audubon owns the original preserve land in fee title, although the Service holds an easement on that land. Maintaining the hunting closure of this area retains a long-held tradition that is respected by both hunters and other refuge visitors.

**Management Strategies:**
*Continue to:*

- Allow hunting based on regulations which correspond to the State of New Hampshire regulations with the following exceptions:

  (a) Hunters must wear at least 400 square inches of hunter orange, except when hunting waterfowl or turkey.

  (b) The season for hunting snowshoe hare and coyotes with dogs is from October 1 to March 15.

  (c) Use of bait is prohibited.

  (d) Temporary blinds are permitted, but must have the name and address visible on the stand and the stand must be removed at the end of the hunting season.

- Ensure the area closed to hunting around Cherry and Little Cherry ponds and the corridor between them is evident via signage and delineation on hunt maps and in the hunt brochure.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain hunting consistent with State hunting regulations and the division-specific regulations mentioned above.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Allow hunters access to the refuge outside of the open hours (i.e., 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

*Within 5 years of CCP approval*

- Work with New Hampshire Fish and Game Department to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with New Hampshire Fish and Game Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide state-sponsored hunter education classes access to the division. Conduct direct outreach to ensure hunters are informed about refuge-specific regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, web pages, media releases, etc.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
*Continue to:*

- Work with New Hampshire Fish and Game Department to inform hunters of the field identification differences between ruffed grouse (i.e., partridge) and the protected spruce grouse via flyers at division kiosks, the refuge website, etc.

- The refuge is open to visitors from 30 minutes before sunrise to 30 minutes after sunset with the exception of hunters, snowmobilers, and those issued a Special Use Permit for a specific activity outside of normal open hours. Hunters may be on the refuge prior to and after these hours as long as they are engaged in lawful hunting activities.

*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Pondicherry Division kiosks, through the Friends of Pondicherry, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

- Work with New Hampshire Fish and Game Department to encourage youth hunting at the division as a means of introducing young people to hunting.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge Web site, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the hunting program; involve hunters and other users in collecting feedback; determine whether Refuge management objectives are being met; and allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Pondicherry Division. Complete all administrative procedures to officially open refuge lands to fishing, based on New Hampshire Fish and Game Department regulations, and any Division-specific conditions.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The Division has been open to fishing since establishment and we propose to continue to offer this use. Although fishing is not as popular as hunting or wildlife observation at Pondicherry, there still are opportunities for visitors to fish the John's River, Ayling Brook, Cherry and Little Cherry ponds.

**Management Strategies:**
*Continue to:*

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- The Pondicherry Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Maintain the Shoreline Trail along the western shore of Cherry Pond for bank fishing opportunities.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

**Rationale:** Although fishing opportunities are limited at Pondicherry, there are places to fish including Cherry Pond, John's River, and Ayling Brook. Other nearby areas, including the White Mountain National Forest or the Connecticut River, provide higher quality fishing opportunities.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Pondicherry Division for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and the most popular recreational activity at Pondicherry. The division is well known for an abundance and variety of wildlife, particularly migratory birds during the nesting season and was recognized as the state's first Important Bird Area where 238 species have been recorded, and 129 of those are confirmed nesters. It also was named a National Natural Landmark by the National Park Service.

**Management Strategies:**
*Continue to:*

- Maintain the current visitor infrastructure including the Little Cherry Pond Trail, the Shoreline Trail along the western shore of Cherry Pond, the Colonel Whipple Trail (a segment of the Cohos Trail), the Mud Pond Trail, the Ramparts Trail (connects the Shoreline Trail to the Colonel Whipple Trail), the Slide Brook Trail, kiosks including the parking lot trailhead and kiosk, the kiosk at the Presidential Recreational Trail parking lot on Airport Road, and the observation decks at Cherry Pond, Little Cherry Pond, and Mud Pond.

- Allow wildlife observation and photography at the Pondicherry Division.
- Partner with the New Hampshire Bureau of Trails under the existing Memorandum of Understanding on maintenance of the Presidential Recreational Trail from Airport Road in Whitefield to Route 115A in Jefferson. This is the primary access used by visitors to enter the division.
- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters, anglers, and snowmobilers. The refuge manager may issue a special use permit for public uses during the closed hours.

*Within 5 years of CCP approval:*

- Construct kiosks at the Colonel Whipple Trail entrance from the East off Whipple Road and at the junction of the Powerline Snowmobile Trail and the Presidential Recreational Trail, south of Waumbek Junction.
- Install wildlife interpretive signs on the Mud Pond and Little Cherry Pond trails.
- Determine whether there is sufficient demand for permanent wildlife viewing blinds strategically located off the trail network.

*Within 10 years of CCP approval:*

- Construct a native surface, primitive portage trail around the Deadwater section of the John's River, if there is sufficient demand.
- Work with New Hampshire Department of Transportation to explore opportunities to increase parking, construct an observation platform, and install interpretive signs at the State Route 115 pull off that overlooks Cherry Pond.
- Construct a native surface, primitive trail that connects the Mud Pond Trail to the Little Cherry Pond Trail if sufficient demand exists and an environmentally acceptable route can be established. The NEPA compliance and compatibility determination were previously completed for a tentative location (see map A.49).

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people that visit the division. Work closely with the Friends of Pondicherry and other partners who host events designed to view wildlife on the division.

***Rationale:***
The entire division is available for wildlife observation and photography; however, there are steps the refuge can take to enhance their time on the division. With such a large number of breeding birds, many of which can only be detected by their song, birding can be intimidating. Providing a variety of methods to help people recognize and appreciate Pondicherry wildlife will contribute to this objective.

**Management Strategies:**
*Continue to:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a Special Use Permit.
- Support wildlife observation events led by the Friends of Pondicherry and other partners, including International Migratory Bird Day, Big Sit, etc.

*Within 5 years of CCP approval:*

- Work with the Friends of Pondicherry to produce a wildlife and plant species guide for Pondicherry that will be available on the refuge website and at division kiosks.
- Work with the Friends of Pondicherry to design a self-guided brochure based on the trail network that helps visitors view and learn about the variety of species inhabiting the division.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Pondicherry Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking and wildlife observation. One examples include the regional Cohos Trail. Where appropriate, we will work with these partners to promote, and distribute information about, this opportunity.

**Management Strategies:**
*Continue to:*

- Work with partners to maintain the Colonel Whipple Trail as a link in the regional Cohos Trail.

*Within 5 years of acquiring new lands:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Pondicherry Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate, and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division. Each of these will be managed consistent with the final finding of appropriateness and compatibility determination. Bicycling and horseback riding are allowed on the State-owned Presidential Recreational Trail that intersects the division, however these uses are not being considered for the division because the current and proposed trail network is not designed for these uses.

**Management Strategies:**
*Continue to:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Work with the New Hampshire Bureau of Trails and the local snowmobile club to provide a groomed snowmobile trail in both of the power line corridors that cross the Division.
- Meet at least annually with the local snowmobile club responsible for grooming and maintaining the snowmobile trails to review special use permit stipulations and conditions so long as this use continues to be compatible and consistent with applicable Services laws, policies, and guidelines.

- There are no closed hours for snowmobilers on the designated trails during the snowmobiling season.

- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

*Within 1 year of CCP approval:*

- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.

- Allow commercial guiding and outfitting for appropriate and compatible uses under a special use permit for guides that charge a fee to customers.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking Pondicherry with other refuge divisions.

*Within 10 years of CCP approval:*

- Work with the Friends of Pondicherry and New Hampshire Fish and Game Department to determine whether there is sufficient demand for canoe and kayak access to Cherry Pond and the John's River. There is limited demand for this use at present, but if it increases beyond capacity (e.g., impacts pond or stream banks), consider hardening options to eliminate impacts.

# Overview
# Sprague Brook Conservation Focus Area (Proposed)

## Richmond, New Hampshire

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 3,016 | 91.2% |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *3,016* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 290 | 8.8% |
| Total Acres in CFA[2, 4] | 3,306 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The Sprague Brook CFA contains a large wetland complex and is a high priority area for many groups, including The Nature Conservancy and local conservation groups. Service land conservation in this CFA would contribute to the larger Quabbin to Cardigan partnership, which is a collaborative, landscape-scale effort to conserve the Monadnock Highlands between two large protected areas: the Quabbin Reservoir in Massachusetts and Mount Cardigan in the White Mountain National Forest in New Hampshire.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 89.5%
- Shrub swamp and Floodplain Forest – 1.4%
- Freshwater Marsh – 2.2%

For more information on habitats in the CFA, see map A.54 and table A.39.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.40 below, there are seven Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to State Species of Greatest Conservation Need (SGCN) including wetland dependent species and forest interior dwelling bird species. These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Sprague Brook CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat for landbirds and waterbirds as well.

The New Hampshire Chapter of The Nature Conservancy (TNC) identified Sprague Brook as one of 13 high priority habitat areas in the Ashuelot River Watershed. These areas were identified due to their ecological diversity and unfragmented landscape (Zankel 2004). Due to this designated priority, TNC initiated the collection of baseline bird and habitat data within the Sprague Brook area. A total of 63 species were recorded including high priority conservation concern forest interior species and wetland dependent species.

Conservation of concern forest interior species observed in the Sprague Brook area include red-shouldered hawk, wood thrush, blackburnian warbler, black-throated blue warbler, ovenbird, and veery (Roth et al. 1996, Rosenberg et al. 2003) (Littleton et al. 2005). Wood thrush and blackburnian warbler are PRRC species that rely on the mature forests in the CFA. American woodcock, another PRRC species, was also recorded.

The large wetland complex within the Sprague Brook CFA may provide suitable habitat for multiple pairs of herons, rails, and bitterns during the breeding season. Detected species include State Species of Greatest Conservation Need such as American bittern, great blue heron, and Virginia rail (Littleton et al. 2005).

Other high priority species of conservation concern that may occur in the Sprague Brook CFA include Canada warbler, a PRRC species, cerulean warbler, Cooper's hawk, Northern goshawk, least bittern, Louisiana waterthrush, and whip-poor-will (Littleton et al. 2005).

2. **Waterfowl**
   Mallards, Canada geese, and wood ducks were detected using the large wetland complex in the Sprague Brook CFA. American black duck, a PRRC species, was not observed during a 2005 breeding bird survey, however, there is a high probability that this species may be present (Littleton et al. 2005).

3. **Diadromous fish**
   The streams and brooks within the Sprague Brook CFA provide high quality, intact aquatic habitat. Roaring Brook, and its Sprague Brook tributary, are free-flowing, with no dams, from their headwaters to the confluence with the Ashuelot River. These pristine brooks provide cold water habitat for PRRC species including Atlantic salmon and native Eastern brook trout. The intact forested landscape within the Sprague Brook CFA provides forested buffers along the streams and wetlands that help to maintain cool water temperatures.

4. **Wetlands**
   The large wetland complexes in the Sprague Brook CFA are influenced by Sprague Brook and its tributaries. The majority of these wetland systems can be characterized as a fen (Littleton et al. 2005), and contain a mosaic of conifer swamp, shrub-swamp, and floodplain forest, and freshwater marsh. The 150-acre wetland complex along the main stem, and 50-acre complex located along a tributary provides important habitat for a diversity of wetland dependent species.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested, and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and native species will dominate. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- We will also manage wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers, and ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse in-stream habitat, and clear aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

We will focus on providing opportunities for the six priority, wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

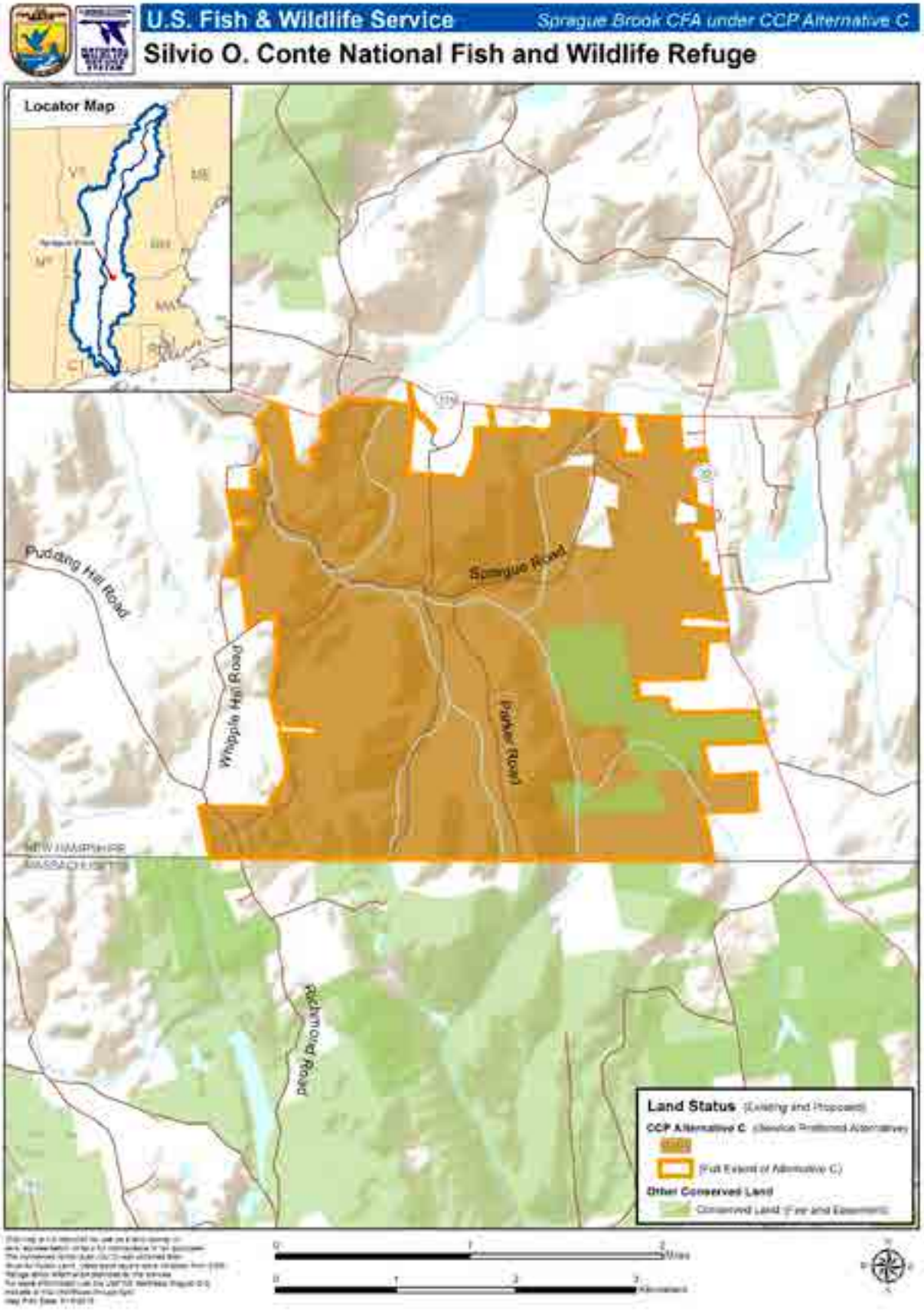
## Were there other special considerations in delineating the CFA boundary?

Sprague Brook has been identified as a Quabbin to Cardigan Collaborative Conservation Focus Area. These focus areas have high ecological diversity and provide habitat connectivity between the Quabbin Reservoir in Massachusetts and Cardigan Mountain in New Hampshire. They were developed through a multi-agency and organizational partnership involving over 20 agencies and organizations from Massachusetts and New Hampshire.

Sprague Brook was also identified by The New Hampshire Chapter of The Nature Conservancy (TNC) as one of 13 high priority habitat areas in the Ashuelot Watershed due to its ecological diversity and unfragmented landscape.

The native brook trout fishery, within the Sprague Brook CFA, has been designated as a Wild Trout Water, an area managed by New Hampshire Fish and Game Department to provide wild trout fishing experience.

*Map A.53. Sprague Brook CFA – Location.*



*Map A.54. Sprague Brook CPA/CFA – Habitat Types.*

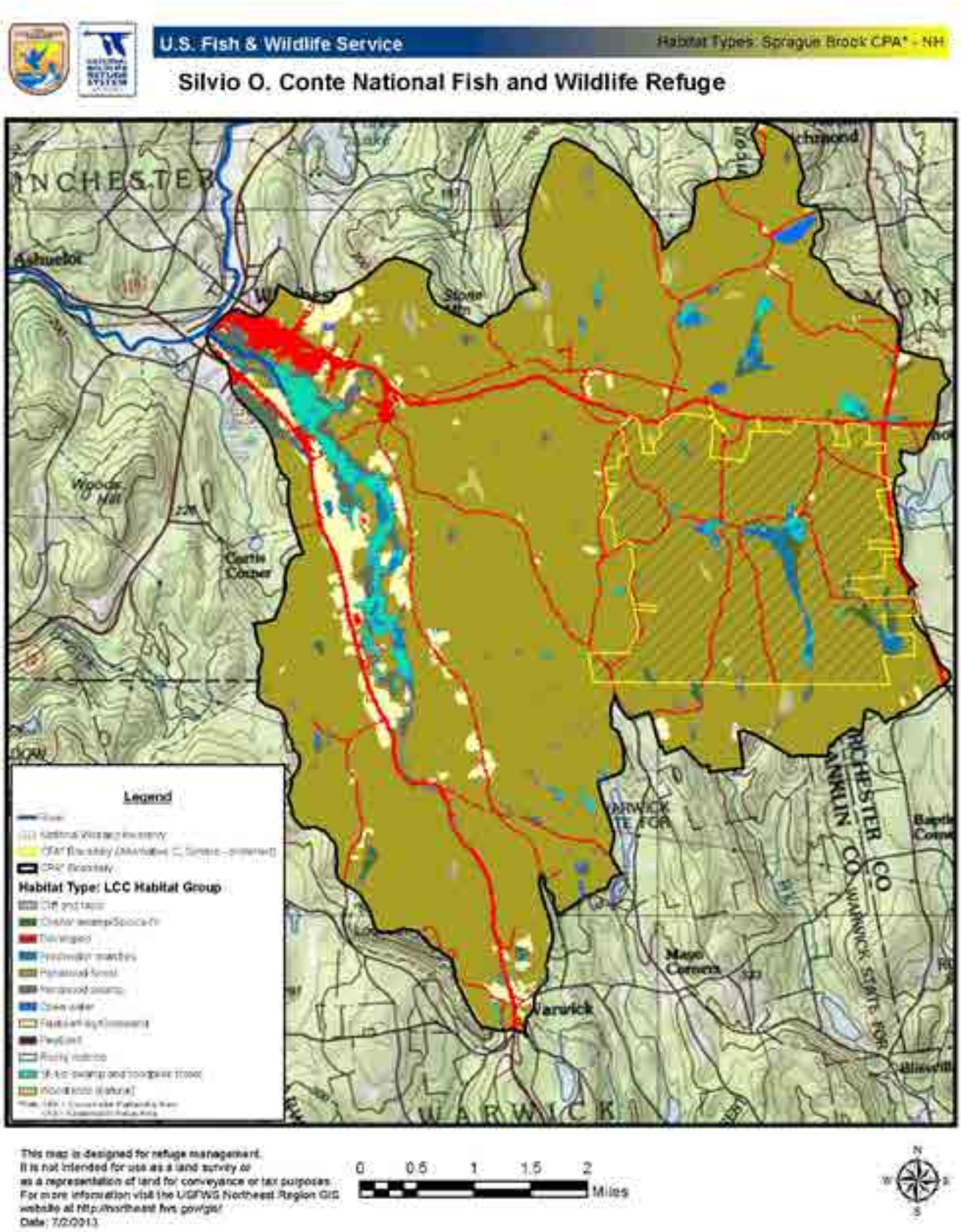


**Table A.39. Sprague Brook CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 152 | 0.8% | 63 | 33 | 0 | 1.9% | 41.4% |
| Hardwood forest | 16,094 | 83.9% | 2,991 | 226 | 0 | 89.5% | 18.6% |
| Hardwood swamp | 354 | 1.8% | 2 | 0 | 0 | 0.0% | 0.4% |
| Shrub swamp and floodplain forest | 433 | 2.3% | 45 | 5 | 0 | 1.4% | 10.5% |
| Woodlands (natural) | 94 | 0.5% | 11 | 0 | 0 | 0.3% | 11.4% |
| *Forested uplands and wetlands subtotal* | *17,128* | *89.3%* | *3,112* | *264* | *0* | *93.1%* | *18.2%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 38 | 0.2% | 0 | 0 | 0 | 0.0% | 0.0% |
| Freshwater marshes | 143 | 0.7% | 74 | 6 | 0 | 2.2% | 51.3% |
| Pasture/hay/grassland | 735 | 3.8% | 5 | 0 | 0 | 0.1% | 0.7% |
| Rocky outcrop | 17 | 0.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Non-forested uplands and wetlands subtotal* | *934* | *4.9%* | *78* | *6* | *0* | *2.3%* | *8.4%* |

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 49 | 0.3% | 7 | 0 | 0 | 0.2% | 14.5% |
| *Inland aquatic habitats subtotal* | *49* | *0.3%* | *7* | *0* | *0* | *0.2%* | *14.5%* |
| **Other** | | | | | | | |
| Developed | 1,070 | 5.6% | 145 | 16 | 0 | 4.3% | 13.5% |
| *Other subtotal* | *1,070* | *5.6%* | *145* | *16* | *0* | *4.3%* | *13.5%* |
| **TOTAL** | **19,181** | **100.0%** | **3,342** | **286** | **0** | **100.0%** | **17.4%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.40. Sprague Brook CFA – Preliminary Priority Refuge Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 2,991 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Red-shouldered Hawk[I,J]<br>Jefferson Salamander[I,J]<br>Veery[A]<br>Bobcat [I]<br>**Ovenbird**[A]<br>Black-throated Blue Warbler[A]<br>Black-throated Green Warbler[A]<br>Eastern Wood Pewee[A,J]<br>Northern Flicker[A,J]<br>Yellow-bellied Sapsucker[A, J]<br>Rose-breasted Grosbeak[A]<br>**Chestnut-sided Warbler**[A,I]<br>**Eastern Red Bat**[I]<br>**Louisiana Waterthrush**<br>American Redstart[A,J]<br>Baltimore Oriole[J]<br>Black-and-white Warbler[J]<br>Black-billed Cuckoo[A,J]<br>Broad-winged hawk[I,J]<br>Whip-poor-will[A,I,,J]<br>Great-crested Flycatcher[J]<br>Northern Goshawk[A,I,J]<br>Purple Finch[A,I]<br>Ruffed Grouse[A]<br>Black Racer[I] |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| **Conifer Swamp[5] - 63 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | Red-shouldered Hawk[I]<br>Rose-breasted Grosbeak[A]<br>Purple Finch[A,I]<br>Veery[A]<br>Wood Duck[A]<br>Northern Parula[A] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Hardwood Swamp[5] - 2 acres** | | |
| North-Central Appalachian acidic swamp[H]<br><br>North Central Interior and Appalachian rich swamp[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. Eastern hemlock is usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer. *North Central Interior and Appalachian rich swamps* are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include red maple, black ash, as well as calcium loving herbs. Conifers include American larch, but typically not northern white cedar, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Shrub Swamp and Floodplain Forest[5] - 45 acres** | | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **Warbling Vireo**<br>**Willow Flycatcher**<br>Black Racer[I]<br>Ruffed Grouse[A]<br>Eastern Ribbon Snake[I]<br>Great Blue Heron[I]<br>Veery[A]<br>American Redstart[A,J]<br>Wood Duck[J]<br>Eastern Kingbird[J]<br>Gray Catbird[J] |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands, and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Woodlands (natural)[5] - 11 acres** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 74 acres** | | |
| **American Black Duck**[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | **American Bittern**[A,I,J]<br>**Marsh Wren**<br>**Virginia Rail**[I]<br>Great Blue Heron[I]<br>Wood Duck[A,J]<br>Northern Harrier[A,J]<br>Northern Leopard Frog[I]<br>Eastern Ribbon Snake[I]<br>Canada Goose[A] |
| **Pasture/Hay/Grassland[5] – 5 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[J]<br>Northern Harrier[A,I,J] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] – 7 acres** | | |
| **Brook Trout[B, F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Northern Redbelly Dace[I]<br>**Slimy Sculpin[I]**<br>Burbot[I] |
| **Atlantic Salmon[B, E, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 Northeastern Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2006 New Hampshire Wildlife Action Plan (Species of Greatest Concern)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Sprague Brook CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, American woodcock, Canada warbler, and blackburnian warbler.

***Rationale:***
We envision healthy forests within the Sprague Brook CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of New Hampshire's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011). This large, contiguous block of matrix forest has been identified by a host of partners including the State of New Hampshire's Wildlife Action Plan, the Nature Conservancy's Lower New England-Northern Piedmont Ecoregional Plan, and the Quabbin-to-Cardigan Collaborative Conservation Plan.

Sprague Brook CFA's hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is most certainly available within the CFA. To date our review of Sprague Brook's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Sprague Brook comes exclusively from a reading of forest history in New England—a legacy of intensive past-use has altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of Sprague Brook are remarkably more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach combining passive management and the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Sprague Brook will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al.

2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, and—if wetlands and riparian areas are present—Canada warbler (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009).

Sprague Brook's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who are thought to be strongly associated with the hemlock forests within Sprague Brook—and have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—when along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Identify forest stands where soils and species composition will support woodcock management.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

- Work with regional partners to survey forests for non-native invasive insects.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Conifer Swamp)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Sprague Brook CFA, softwood swamps frequently have undergone significant alteration and have potential for restoration. This habitat type is often found in small patches on mineral soils that are nutrient poor; there may be an organic layer, but generally deep peat soils are absent. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. The dynamic nature of the watertable drives complexes of forest upland and wetland species including red maple, balsam fir, red spruce, and ash species. Where soils tend more to alkaline conditions white cedar is a common tree species, and the shrub layer is generally more diverse. Within the Connecticut River watershed, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in softwood swamps are not well understood. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Sprague Brook will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Where needed, restoration of softwood swamp habitats will create high-quality habitat for neotropical migratory birds. Closed canopy softwood forests that include white cedar and other softwoods provide important mast, food, nesting, and cover. Softwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert and Faccio 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Conifer swamps in the Sprague Brook CFA are within a matrix of contiguous

forest, where fragmentation is not a concern. Conifer swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Sprague Brook CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State of New Hampshire, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

The wetland complex along Sprague Brook is relatively large, containing a mosaic of shrub swamp, conifer swamp, and freshwater marsh. Suitable habitat may exist for multiple pairs of herons, rails, and bitterns during the breeding season. There is also a high probability that this wetland complex will provide habitat for several state species of greatest conservation need including common moorhen, least bittern, and sora rail.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

Management of the shrub swamp communities may be required to maintain shrub dominance. Most shrub swamps maintain themselves, but tree species, such as red maple, can become established, and dominate the wetland community. Invasive plants, such as common reed, are a threat to these communities, and mechanical and chemical treatment of this invasive reed is necessary. Management of these shrub swamps will not only benefit American woodcock, but other shrub swamp specialists, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation, and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests near foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without

jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complimented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Sprague Brook CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the Sprague Brook watershed.

Our coarse-scale habitat analysis of this CFA identifies these wetlands as scattered throughout the CFA, with a large percent occurring along Sprague Brook. This wetland complex is relatively large, containing a mosaic of shrub swamp, conifer swamp, and freshwater marsh. Suitable habitat exists for multiple pairs of herons, rails, and bitterns during the breeding season. There is also a high probability that several state species of greatest conservation need may be present including common moorhen, least bittern, sora rail, and American black duck.

American black duck is a refuge priority resource of concern, and use freshwater marsh and shrub-swamp habitats for breeding and foraging. Well-concealed nests are placed on the ground in uplands near beaver impoundments, floodplains, alder-lined brooks and other wetlands. Brood rearing habitat includes emergent marsh or flooded wetlands with abundant emergent vegetation, sedges, submerged aquatic plants and scrub-shrub vegetation rich in invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001). An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for American black duck.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Encourage local landowners to use New Hampshire Best Management Practices within active agricultural fields that are located along the perimeter of marsh habitats.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock; areas not managed for woodcock will be allowed to revert to natural conditions.

***Rationale:***
Less than one percent of the Sprague Brook CFA is typed as pasture, hay, and grassland habitat. The management focus for the Sprague Brook CFA is to provide habitat for forest dependent species including wood

thrush, blackburnian warbler, Canada warbler, and American woodcock (see Sub-objective 1.1a). American woodcock require varying habitat conditions, including open habitats such as pastures, hayfields, and grasslands. Habitats with minimal herbaceous cover in the spring are used for courtship displays, while open areas with sparse shrub or clumped herbaceous vegetation are used for roosting. Fields with moist soil conditions will also be used for foraging (McAuley et al. 1996).

Pasture, hay, and grasslands will be managed in conjunction with the other habitat conditions that woodcock require. Due to these specific habitat requirements, and our unfamiliarity with the overall habitat conditions in the CFA, a comprehensive, multi-scale forest and wildlife habitat inventory will be necessary to implement refuge strategies. This inventory will need to encompass all habitats within the CFA and associated landscape. Baseline information on the condition of pasture, hay, and grassland habitats at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct an inventory of pasture, hay, and grassland habitats to determine their condition, size and location, and incorporate them into the management strategies for American woodcock in the HMP.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and Atlantic salmon.

***Rationale:***
The streams and brooks within the Sprague Brook CFA provide high quality, intact aquatic habitat. Roaring Brook and its Sprague Brook tributary are free-flowing, with no dams, from their headwaters to the confluence with the Ashuelot River. These pristine brooks provide cold water habitat for Atlantic salmon and wild Eastern brook trout. Brook trout and Atlantic salmon are sensitive to extreme temperature fluctuations, and require water temperatures between 40-70 degrees Fahrenheit for spawning, growth, and survival. The intact forested landscape within the Sprague Brook CFA provides forested buffers along the streams and wetlands that help to maintain these cool temperatures. The native brook trout fishery, within the Sprague Brook CFA, has been designated as a Wild Trout Water, an area managed by New Hampshire Fish and Game Department to provide wild trout fishing experience.

Management of water resources in the Sprague Brook CFA will focus on providing rivers and streams with clear aquatic species passage to spawning and wintering habitat, and in-stream habitat that is cold and structurally diverse. The protection and restoration of these aquatic resources will further conservation in the Ashuelot River Watershed.

Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. We will work with partners to analyze current available data, and conduct additional assessments, as needed, to inform more detailed management and monitoring strategies within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.

- Work with partners to conduct stream assessments to identify manmade physical barriers (e.g. impassable road crossings, culverts and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Sprague Brook Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Sprague Brook Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Sprague Brook Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Sprague Brook Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Sprague Brook Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Sprague Brook Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Sprague Brook Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Sprague Brook Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Sprague Brook Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.

- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Sprague Brook Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Sprague Brook Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below.

***Rationale:***
The Sprague Brook CFA is a popular area to hunt white-tailed deer, moose, Eastern wild turkey, black bear, and small game. Hunting, consistent with the final compatibility determination, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations

  (a) The season for hunting snowshoe hare and coyotes with dogs is from October 1 to March 15.

  (b) Use of bait is prohibited.

  (c) Allow temporary tree stands and blinds that meet state hunting regulations and do not harm trees or other refuge vegetation. Tree stands and blinds must have the owner's name and phone number clearly displayed, and they must be removed at the end of the hunt season.

- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Sprague Brook Division kiosks, through a friends group, and in local businesses.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with New Hampshire Fish and Game Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Sprague Brook Division after completing all administrative procedures to officially open refuge lands to fishing, based on New Hampshire Fish and Game Department regulations, and division-specific conditions, if necessary.

***Rationale:***
There are several streams in the proposed CFA including Roaring Brook and Mirey Brook. Both streams support Eastern brook trout. A variety of other game fish are found in streams and ponds within the CFA including rainbow trout and largemouth bass. Fishing is a popular activity throughout this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The Sprague Brook Division would be open to visitors actively engaged in fishing during the seasons and times established by the state in their annual fishing regulations.

*Within 5 years of acquiring land with fishable waters:*

- Produce a brochure that highlights fishing opportunities for distribution at a division kiosk and the refuge website.
- Work with the New Hampshire Fish to inventory and assess fish populations on the division.

**Inventory and Monitoring Strategies:**
*Within 5 years of acquiring land with fishable waters:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available at the refuge website, refuge offices, division kiosks, through friends groups, and in local businesses.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the division.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. Local organizations such as the Monadnock Chapter of New Hampshire Audubon and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exceptions listed for hunters and anglers. The refuge manager may issue a special use permit for public uses during the closed hours.

- Install an informational kiosk to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring land:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups such as the Monadnock Chapter of New Hampshire Audubon and other environmental organizations to include wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring land:*

- Develop a public access strategy and required planning (i.e. NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Sprague Brook Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource. Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Allow compatible outdoor recreational opportunities on the Sprague Brook Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge properties.

USFWS

*Nulhegan River from the Nulhegan Basin Division, Vermont*

# State of Vermont

- **Nulhegan Basin Conservation Focus Area (Existing Refuge Division)**
- **Ompompanoosuc Conservation Focus Area (Proposed)**
- **Ottauquechee River Conservation Focus Area (Proposed)**
- **West River Conservation Focus Area (Proposed)**
- **White River Conservation Focus Area (Proposed)**
- **Putney Mountain Unit (Existing Refuge Unit)**

# Overview
# Nulhegan Basin Conservation Focus Area
# (Existing Refuge Division)

## Lewis, Bloomfield, Brunswick, Ferdinand, and Brighton, Vermont

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 32,541 | 98.9 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *26,605* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *5,936* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 368 | 1.1 % |
| Total Acres in CFA[2, 4] | 32,909 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS. [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The existing Nulhegan Basin Division is part of the larger 132,000-acre Kingdom Heritage Lands. The area includes a mosaic of conserved lands, including the Wenlock and West Mountain Wildlife Management Areas and working forest lands (e.g., Plum Creek Timber Company). Our proposed expansion to the Nulhegan Basin CFA would fill in gaps in the conserved lands network within this larger core area and better protect the Nulhegan River watershed, particularly a very rich, northern boreal wetlands complex.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Spruce-fir – 55.7 percent.
- Peatlands – 1.2 percent.
- Shrub Swamps and Floodplain Forest - 1 percent.

See map A.59 and table A.41 for more detailed habitat information for the CFA.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.42 below, there are eight refuge priority refuge resources of concern (PRRC) terrestrial and aquatic species that rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to biological integrity diversity and environmental health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to Canada lynx, a federally threatened species recently confirmed breeding in northeastern Vermont, and as a deer wintering area for white-tailed deer. These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   Canada lynx, a federally threatened species, have been confirmed breeding in northeastern Vermont. A family group was detected in the winters of 2012 and 2013 within the Nulhegan Basin CFA. In consultation with the Service's New England Field Office, it was concluded that the refuge will not manage habitats specifically for Canada lynx. This determination was based in large part, on our understanding that the use of these lands by lynx and their long-term occupancy potential are poorly understood. In addition, critical habitat for Canada lynx in Vermont has not been designated under the authority of the Endangered Species Act, and neither the State of Vermont nor the Service has developed a lynx recovery plan.

   Conservation efforts for this species will be done at the regional scale, and additional information is necessary to evaluate the importance of Vermont for Canada lynx and to determine what measures are needed to ensure their persistence within the State. We will continue to monitor Canada lynx populations in the Nulhegan Basin CFA, and work with partners to develop a lynx management plan for the State. We will also work with our New England Field Office to ensure that none of our programs or activities could result in an incidental take of lynx.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA) and habitats along the river's main stem receive higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Nulhegan Basin CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

   The Nulhegan Basin CFA is part of a larger 132,000-acre conservation area known as the Kingdom Heritage Lands. The CFA is one of three large parcels that were conserved through a complex partnership of public and private entities, including the Vermont Agency of Natural Resources, and now, Plum Creek, LLC. This combination of ownerships and easements provides long-term conservation of contiguous habitat important for many species, including migratory birds.

   The bogs, fens, shrub-dominated wetlands, and swamps, as well as lowland conifer, montane, and hardwood forests in the CFA support a diversity of breeding birds. Six years of breeding landbird survey data, and countless observations made by expert birders have detected numerous species of high conservation concern. Several of these species are uncommon in the Northeast, occurring at the southern periphery of their range. These include resident and migratory boreal species including boreal chickadee, black-backed woodpecker, spruce grouse, gray jay, bay-breasted warbler, rusty blackbird, and olive-sided flycatcher. The contiguous forests in the Nulhegan Basin area also provide habitat for forest interior species such as Canada warbler, ovenbird, blackburnian warbler, black-throated blue warbler, and black-throated green warbler. Blackburnian warbler, Canada warbler ,and black-throated blue warbler are PRRC species that require different plant species composition and structure within a mature forest. While American woodcock and rusty blackbird, also PRRC species, rely on early successional forests in the CFA.

3. **Waterfowl**
   Shrub swamps, peatlands, slow moving streams, secluded ponds, and numerous beaver wetlands provide breeding and migrating habitat for various waterfowl species including American black duck, a PRRC species, wood ducks, common mergansers, hooded mergansers, and Canada geese.

4. **Diadromous fish and other aquatic species**
   The Nulhegan River and three of its four major tributaries—the North, Yellow, and Black branches—flow through the Nulhegan Basin CFA. These cold water rivers provide important habitat for PRRC species including brook trout and Atlantic salmon. Both of these species are a high priority for conservation for the State and the Service's Northeast Region. Native brook trout populations are also present in Lewis and McConnell Ponds within the CFA.

5. **Wetlands**
   The CFA is predominately forested, interspersed with streams and various wetlands. More than 3,000 acres of conifer dominated forested wetlands occur in the CFA, as well as 413 acres of peatlands and 348 acres of shrub swamp and floodplain forest. The majority of these wetlands are concentrated in the lower elevations, and associated with the streams and ponds in the CFA.

6. **Other**
   The Nulhegan Basin contains a deer wintering area (DWA), which is important to the species' survival during winter. DWAs have two important components: core areas of softwoods with high crown closure that provide shelter, and patches of mixed hardwood providing accessible browse within or near the core of the DWA. Functional shelter for deer includes softwood cover at least 35 feet tall with at least 70 percent crown closure (Reay et al. 1990). In addition to providing shelter from severe weather and accessible browse, good wintering areas ensure that deer can travel easily to forage and escape predators.

   Within the CFA, the majority of the basin bottom was historically used by wintering deer. Management within this area will focus on providing a multi-age lowland spruce-fir forest with an appropriate age and diameter distribution for core winter shelter, and early successional forests for winter browse. A diversity of forest composition and structure will also provide habitat for refuge priority resources of concern.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. Forests in the CFA will be structurally diverse (different size classes) and native species will dominate. Appendix J provides general forest management definitions and guidelines.
- Our wetland management will focus on maintaining the natural hydrology and native species composition. Given their low occurrence, invasive plant management will be a priority.
- In open water habitats (streams, rivers and ponds), we will focus on maintaining forested stream buffers, structurally diverse instream habitat, and continuous aquatic species passage to spawning and wintering habitat.

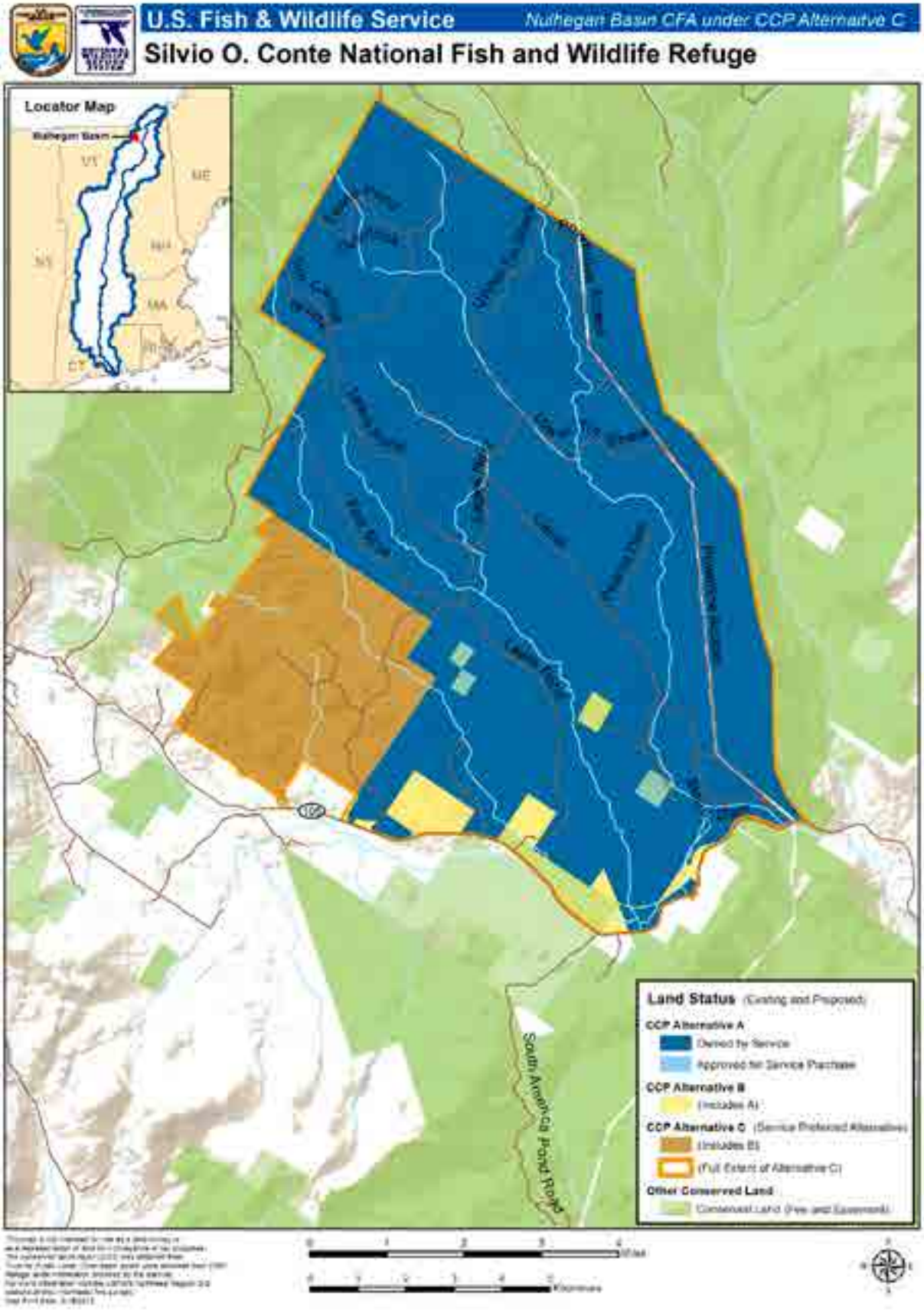
## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

The National Wildlife Refuge System Improvement Act of 1997 identified hunting, fishing, wildlife observation, photography, interpretation, and environmental education as priority, wildlife-dependent uses. As such, these uses would receive priority on refuge lands. The larger Nulhegan Basin has a long history as a valued landscape for hunting and fishing, while in recent years, wildlife observation has increased in popularity. The area is also popular for snowmobiling in the winter. Maps A.56 and A.57 show the proposed public use infrastructure under alternative C.

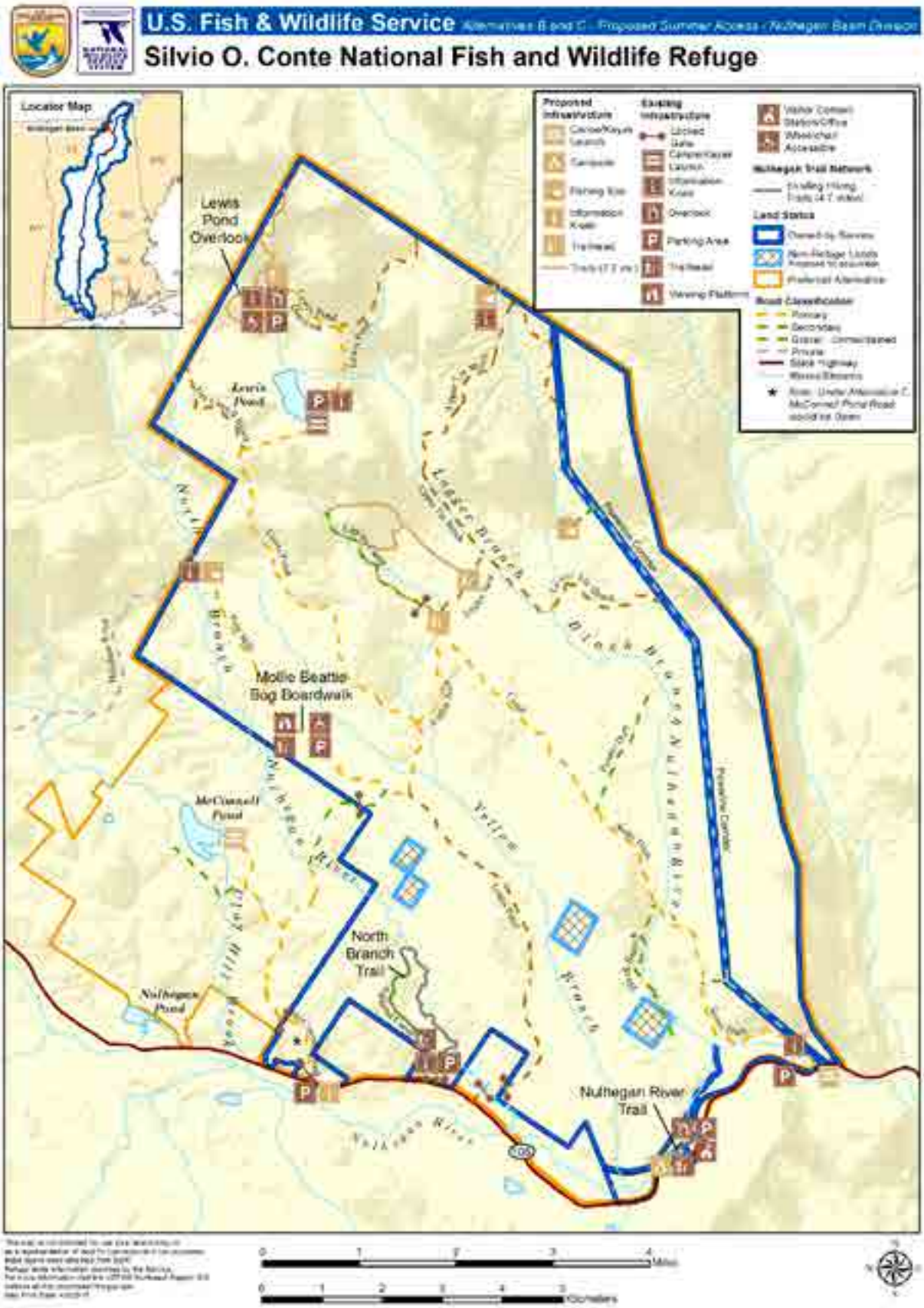
## Does the proposed CFA have special ecological, cultural, or recreational features or designation of regional, State, or local importance?

The National Audubon Society recognizes the Nulhegan Basin as an Important Bird Area (IBA) (National Audubon Society 2013). The extensive boreal habitat is home to many rare species, including the State endangered spruce grouse and common loon. Other species found in the IBA include gray jay, Cape May warbler, bay-breasted warbler, boreal chickadee, and black-backed woodpecker.

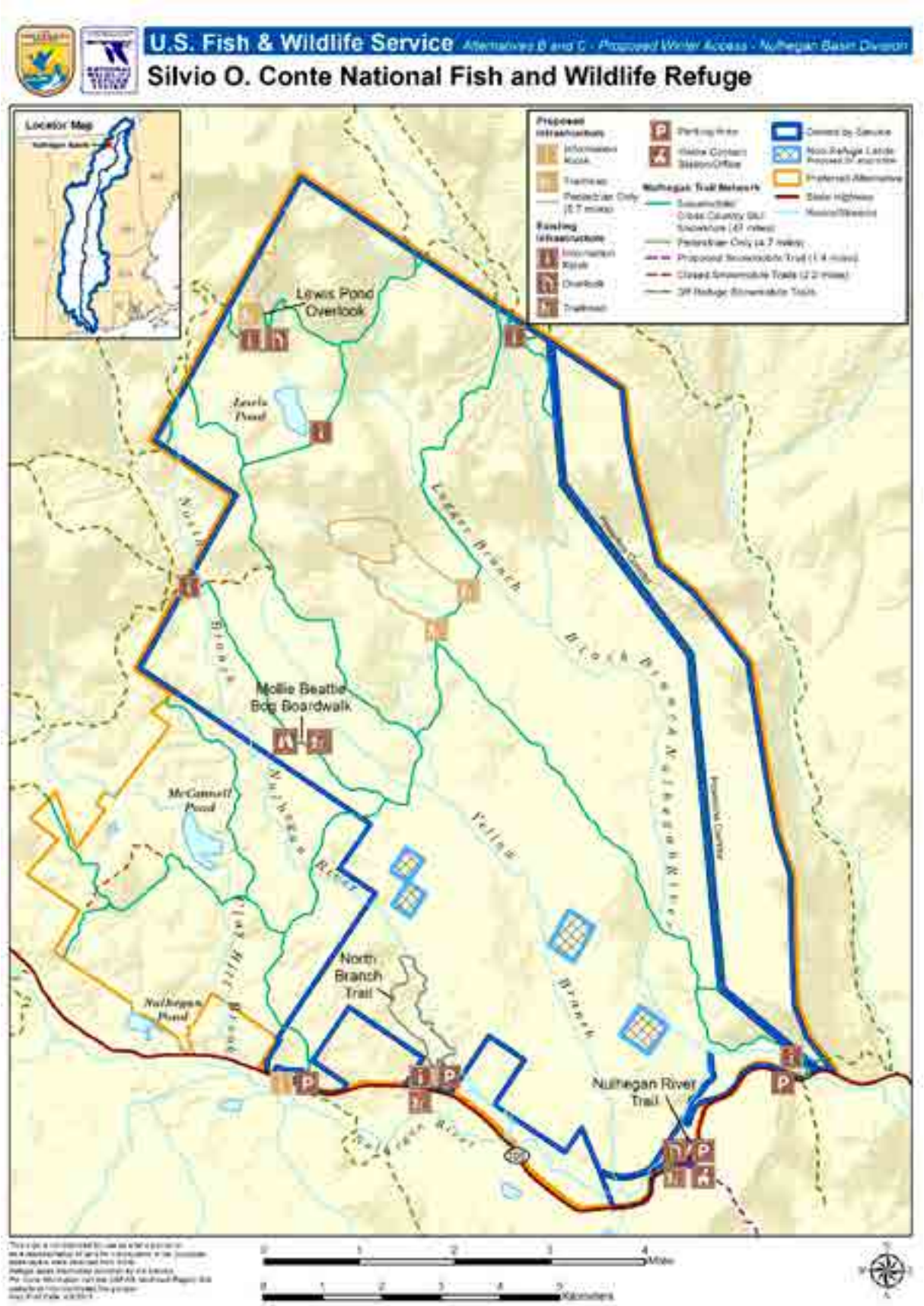
*Map A.55. Proposed Nulhegan Basin CFA – Location.*



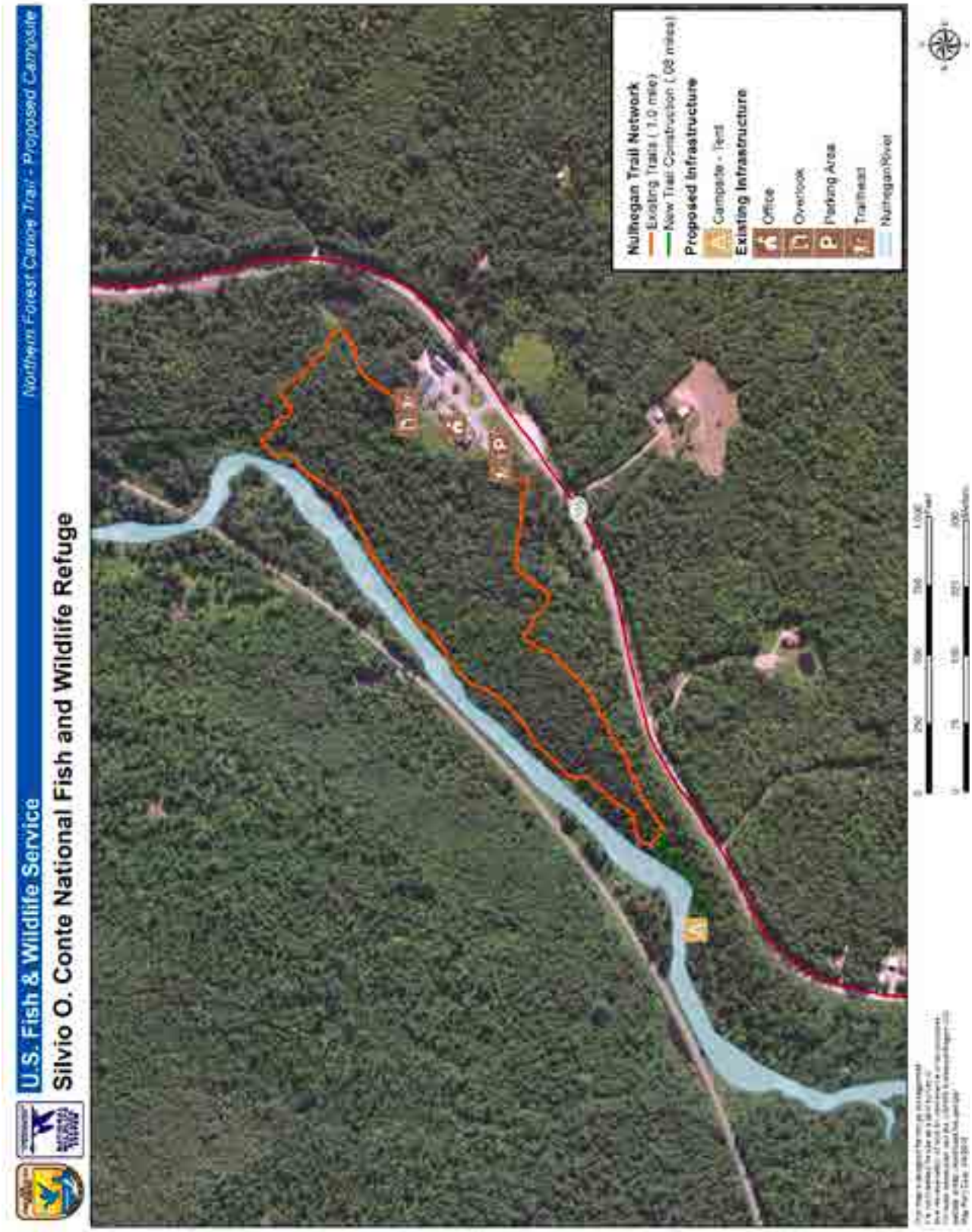
*Map A.56. Nulhegan Basin CFA – Proposed Summer Public Access.*



*Map A.57. Nulhegan Basin CFA – Proposed Winter Public Access.*



*Map A.58. Proposed Nulhegan Canoe Trail Campsite.*



*Map A.59. Nulhegan Basin CPA/CFA – Habitat Types.*

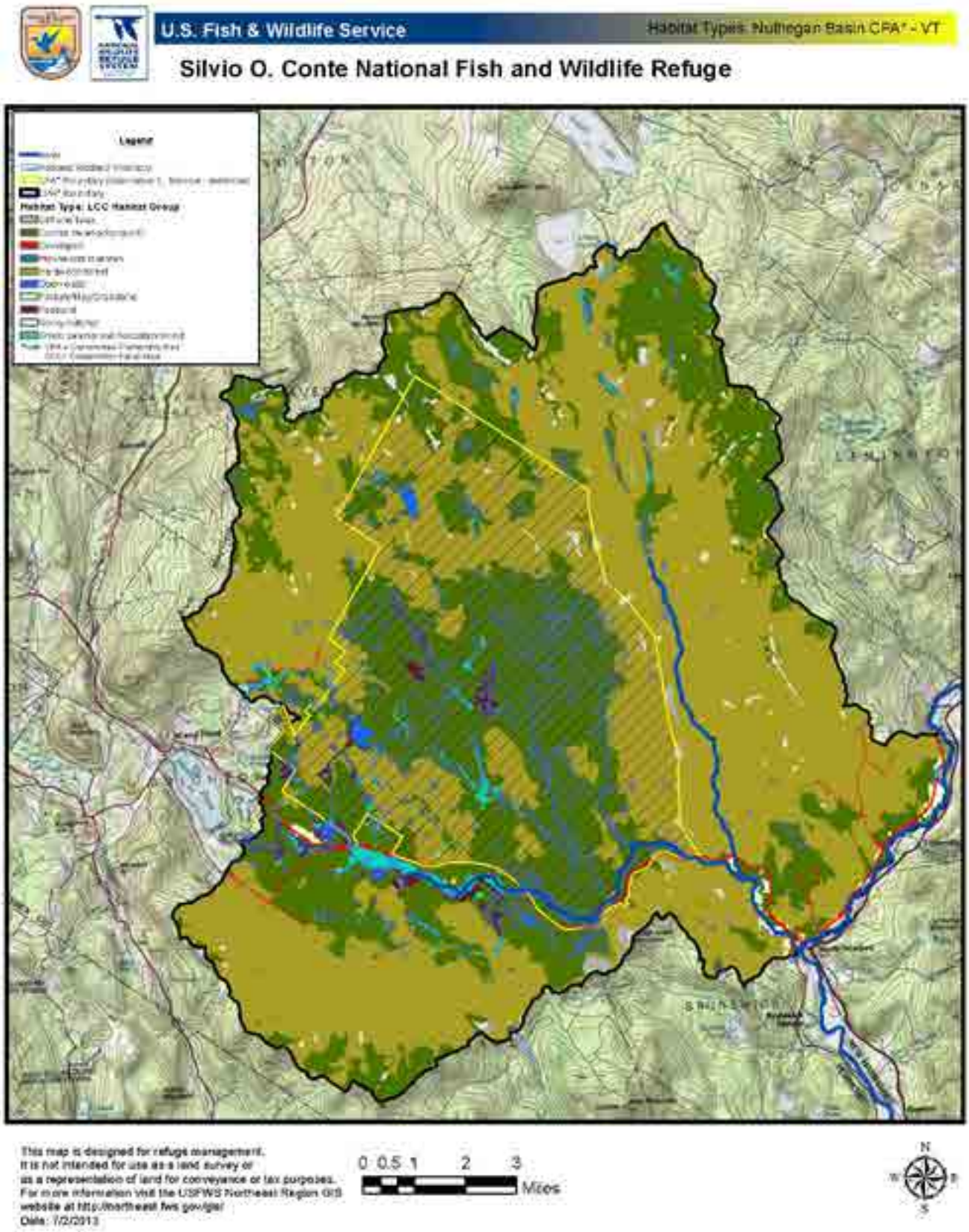


**Table A.41. Nulhegan Basin CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 38,154 | 37.9% | 18,549 | 311 | 15,171 | 55.7% | 48.6% |
| Hardwood forest | 57,047 | 56.7% | 13,448 | 10 | 10,713 | 40.4% | 23.6% |
| Shrub swamp and floodplain forest | 1,211 | 1.2% | 348 | 0 | 204 | 1.0% | 28.7% |
| *Forested uplands and wetlands subtotal* | *96,412* | *95.9%* | *32,346* | *322* | *26,088* | *97.1%* | *33.5%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 486 | 0.5% | 40 | 0 | 40 | 0.1% | 8.2% |
| Freshwater marshes | 16 | 0.0% | 4 | 0 | 2 | 0.0% | 23.0% |
| Pasture/hay/grassland | 521 | 0.5% | 2 | 0 | 0 | 0.0% | 0.3% |
| Peatland | 895 | 0.9% | 413 | 0 | 265 | 1.2% | 46.1% |
| Rocky outcrop | 1,176 | 1.2% | 200 | 0 | 200 | 0.6% | 17.0% |
| *Non-forested uplands and wetlands subtotal* | *3,094* | *3.1%* | *658* | *0* | *507* | *2.0%* | *21.3%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 260 | 0.3% | 163 | 0 | 72 | 0.5% | 62.8% |
| *Inland aquatic habitats subtotal* | *260* | *0.3%* | *163* | *0* | *72* | *0.5%* | *62.8%* |
| **Other** | | | | | | | |
| Developed | 777 | 0.8% | 149 | 29 | 74 | 0.4% | 19.2% |
| *Other subtotal* | *777* | *0.8%* | *149* | *29* | *74* | *0.4%* | *19.2%* |
| **TOTAL** | **100,543** | **100.0%** | **33,317** | **351** | **26,741** | **100.0%** | **33.1%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.42. Nulhegan Basin CFA – Priority Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp/Spruce-fir Forest[5] - 18,549 acres** | | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | Cape May Warbler[A, J]<br>Boreal Chickadee[A, J]<br>Purple Finch[A, J]<br>Black-throated Green Warbler[A, J]<br>**Spruce Grouse [A, I]**<br>**American Marten[I]**<br>Canada Lynx[I, J]<br>Gray Jay[A, I, J]<br>Black-backed Woodpecker [A, I, J]<br>Bay-breasted Warbler[A, I, J]<br>**White-throated Sparrow**<br>**Blackpoll Warbler[A, I]**<br>Brown Creeper[J]<br>Northern Saw-whet Owl[J]<br>Olive-sided Flycatcher[A, I, J]<br>Palm Warbler[A,J]<br>Pine Grosbeak[A, J]<br>Sharp-shinned Hawk[J]<br>Yellow-bellied Flycatcher[J]<br>Northern Parula[A] |
| Rusty Blackbird[A, C] | Breeding habitat includes conifer dominated forested wetlands interspersed with shrub swamps and peatlands. Young spruce and fir may be required for nesting (Greenland et al, 2010, Powell et al., 2010, and Matsuoka et al, 2010). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| **Hardwood Forest[5] - 13,448 acres** | | |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | **Ruffed Grouse[A, I]**<br>Whip-poor-will[A, I, J]<br>Smooth Green Snake[I]<br>Canada Lynx[I]<br>**Chestnut-sided Warbler[A, I]**<br>Purple Finch[A, J]<br>**Ovenbird[A]**<br>**Eastern Red Bat[I]**<br>American Redstart[A, J]<br>Black-and-white Warbler[J]<br>Broad-winged hawk[J]<br>Eastern Wood-pewee[A, J]<br>Northern Flicker[A, J]<br>Northern Goshawk[A, I, J]<br>Red-shouldered Hawk[I, J]<br>Rose-breasted Grosbeak[A,J]<br>Canada Warbler[A,I]<br>Yellow-bellied Sapsucker[A, J]<br>Veery[A,I]<br>Black-billed Cuckoo[A,I]<br>Black-throated Green Warbler[A]<br>Northern Parula[A] |
| Black-throated Blue Warbler[A] | Breeding habitat includes mature deciduous and mixed deciduous-conifer forests with a shrubby understory (Degraaf et al. 2001, Hodgman et al. 2000, Dobbs 2007, Dunn et al. 1997) | |
| **Blackburnian Warbler[A]** | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Dunn et al. 1997, Morse 2004). | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 348 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands, and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | Chestnut-sided Warbler[A, I]<br>Black Racer[I]<br>Ruffed Grouse[A, I]<br>**Warbling Vireo**<br>**Willow Flycatcher**<br>**Wood Turtle[I]**<br>American Redstart[A, J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>Wood Duck[A, J]<br>Veery[A,I] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Rocky Outcrop[5] - 200 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H]<br><br>Laurentian-Acadian calcareous rocky outcrop[H] | *The Northern Appalachian-Acadian rocky heath outcrop system* occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Lowbush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open.<br><br>*Laurentian-Acadian calcareous rocky outcrop* occurs on ridges or summits of circumneutral to calcareous bedrock. Sites are often exposed and dry; however, there may be local areas of more moist conditions. The vegetation is often a mosaic of woodlands and open glades. This system may also occur on rocks that are primarily acidic but with a local influence of calcium through weathering (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 4 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Peatlands - 413 acres** | | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Olive-sided Flycatcher[A, I, J]<br>Southern Bog Lemming[I, J]<br>**Mink Frog**<br>**Palm Warbler[A]**<br>Black-backed Woodpecker[A, I, J]<br>Eastern Kingbird[J]<br>Northern Harrier[A, I, J] |
| **Cliff and Talus[5] – 40 Acres** | | |
| Laurentian-Acadian acidic cliff and talus[H]<br><br>Laurentian-Acadian calcareous cliff and talus[H] | These cliff systems occur at low to mid elevations, well below treeline. The vegetation within the *acidic cliff and talus system* is patchy and often sparse, punctuated with patches of small trees such as birches and spruce species. Species that prefer calcium rich soils are absent. In north-facing or other sheltered settings where cold air accumulates at the bottom of slopes, a shrubland of heaths and reindeer lichens can develop.<br><br>*The calcareous cliff and talus system* has more nutrient rich soils, and the vegetation is often sparse, but may include patches of small trees including northern white cedar, which may be the dominate species. Ash species and basswood are woody indicators of the enriched setting (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] - 163 acres** | | |
| **Brook Trout**[B, F] | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Eastern Pearlshell[I]<br>Riffle Snaketail[I]<br>Brook Snaketail[I]<br>Maine Snaketail[I]<br>Zebra Clubtail[I] |
| **Atlantic Salmon**[B, F, G] | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Canada Goose[A]<br>Wood Duck[A]<br>Hooded Merganser[J]<br>Green-winged Teal[J]<br>Mallard[J]<br>**Common Merganser**<br>**Ring-necked Duck**<br>**Common Loon**[A,I]<br>Osprey[I] |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2005 Vermont Wildlife Action Plan (Species of Greatest Conservation Need)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Nulhegan Basin CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Spruce-fir Forests)**
Improve the diversity of seral stages (where and when possible), restore historic composition and structure, and improve landscape connectivity of spruce-fir habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including blackburnian warbler, rusty blackbird, and Canada warbler.

***Rationale:***
There is a greater likelihood of meeting more species' requirements when more varied habitat conditions are present, and thus a higher degree of wildlife diversity can be expected (MacArthur and MacArthur 1961, Hunter Jr. 1990, Askins 2002, DeGraaf et al. 2006). And further, a traditional principle of ecology holds that diverse ecosystems are more stable than ecosystems that are less diverse (Elton 1958). This has important implications for climate change and wildlife conservation.

At the landscape-scale (here defined as the CFA) managing forests for diversity requires managing the patterns of succession that determine the age structure of the landscape. This is important for two reasons: (1) some successional stages have more species than others; and (2) each stage has a different, although not usually unique, set of species. In this discussion we refer to managing the age structure of the landscape, rather than managing succession, because the age of the forest stand is a reasonable index of its successional state.

While much of our forest management will attempt to move the Nulhegan's relatively young spruce-fir forests (majority of the forest is younger than 30-45 years old (Lapin and Engstrom 2002)) toward an older condition, across the CFA spruce-fir forests will contain a variety of patches in different size classes and developmental stages. Species dependent upon disturbances that create early successional forested habitats, like rusty blackbird, are declining as remaining patches of young forest mature (Matsuoka et al. 2010, Powell et al. 2010, C. Foss personal communication). Maintaining stands of young spruce-fir adjacent to wetland areas within the CFA may benefit rusty blackbirds. Enhancing the horizontal structure of spruce-fir forests across the CFA should support other species of conservation concern like bobcat, palm warbler, spruce grouse, and—if wetlands and riparian areas are present—Canada warbler (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009).

Early successional spruce-fir also serves as preferred habitat for snowshoe hare, an important prey species for the Federally-endangered Canada lynx recently documented within the CFA. While we recognize the importance of early successional habitat to Canada lynx, critical habitat for Canada lynx in Vermont has not been designated under the authority of the Endangered Species Act. Further, neither the State of Vermont nor the Service has developed a management plan that evaluates the importance of Vermont for Canada lynx and measures needed to ensure their persistence within the State. Although these planning efforts are not available to inform Canada lynx management needs at the Nulhegan Basin CFA, an evaluation was conducted by the Service's New England Field Office and refuge staff on the importance of the CFA to Canada lynx.

We assume that all elements that are considered essential for supporting breeding Canada lynx are present within the Nulhegan Basin landscape, as evidenced by recent breeding records. Aubry et al. (2000) suggest the average home range for Canada lynx in southern boreal forests, such as those found in Vermont, is approximately 18,000 acres for females and 37,000 acres for males. The Nulhegan Basin CFA is approximately 33,000 acres;

we estimate that the CFA would support no more than two female and one male Canada lynx. Within the larger Nulhegan Basin, we estimate support for no more than 11 female and 5 male Canada lynx. Based on these estimates, we assume the Nulhegan Basin is incapable of supporting a standalone Canada lynx population, and the persistence of Canada lynx in Vermont may be reliant upon receiving periodic dispersal from larger source populations, such as those found in Maine. To ensure that Canada lynx persist in Vermont, it is important that efforts to conserve the species be developed at a landscape scale, since no single landowner is likely to support enough habitat for this species. We will continue to monitor Canada lynx populations in the Nulhegan Basin CFA, and work with adjacent landowners, the VFWD, the New Hampshire Fish and Game Department, and the New England Field Office to develop a lynx management plan for northern Vermont and New Hampshire.

Maintaining diversity across the landscape must include an adequate number and area of old forests simply because they represent one portion of the successional sequence, and especially because they represent what is likely to be the most biologically diverse portion of the sequence (largely due to tree bole users). Areas like the Nulhegan Basin CFA, where natural disturbance regimes are small-scale and relatively uncommon, old forests once dominated the landscape (Lorimer 1977, Bormann and Likens 1979, Cogbill 2000, Fraver et al. 2009). While we are unable to return to a pre-European settlement forest, we can redress some of the imbalance currently within the CFA. Through a combination of silviculture aimed at restoring old-growth characteristics (Keeton 2004, D'Amato and Catanzaro 2007, Bauhus et al. 2009), long rotation systems and unmanaged areas we hope to create an important habitat condition missing from the hardwood and mixed-wood forests of the Nulhegan. By arranging long rotation stands to encircle a core of forests determined to possess late successional characteristics we can buffer these areas, significantly increasing its effective size. These efforts will aid a suite of species that include numerous bat species that require large diameter trees for roosting, barred owls, ovenbirds, and red bats.

Ecologically sustainable management in red spruce-balsam fir forests in the Nulhegan will ideally retain spruce as the dominant species because this long-lived species stabilizes the light environment in the understory, influences the texture and chemistry of forest litter, provides habitat for numerous birds and mammals, and is commercially valuable for timber and pulp. Red spruce appears to be vulnerable to temporary displacement by balsam fir and other fast-growing pioneer species (including red maple, trembling aspen, big-tooth aspen, and paper birch), particularly after stand-replacing disturbances or preferential high-grading and disease (Frank and Bjorkbom 1973, Seymour and Hunter Jr. 1992, Bouchard et al. 2007). Its seeds are short-lived and do not persist in the soil seed bank (Blum 1990). Individual longevity can be longer than 300 years, and is considerably longer than that of balsam fir (about 70 years). Since red spruce is economically valuable for timber and pulp (Seymour 1992), and usually has better health and sizes than balsam fir, it has been harvested repeatedly on the same sites in the Nulhegan Basin since the mid-1800s (Whitney 1996; Cogbill 2000). It has low genetic variability and may lack adaptability to environmental stress including global climate change (DeHayes and Hawley 1992). Red spruce is in documented decline in some parts of its range (Siccama et al. 1982; Adams and Stephenson 1989; Klein et al. 1991; Battles and Fahey 1995). Improving the representation of red spruce in the Nulhegan's spruce-fir stands will provide food and cover for various animals and birds. The spruce grouse feeds on the buds and foliage; red squirrels eat both the buds and seeds; varying hare species browse twigs and foliage; and porcupines feed upon the bark.

Our understanding of the forest structure within Nulhegan Basin comes from a forest-based habitat inventory conducted in 2007 (USFWS unpublished), aerial photo interpretation by contractors and a reading of the forest history within the Nulhegan Basin (Cogbill 2000; Gove 2003). Much of the spruce-fir forest within the Nulhegan Basin CFA was harvested prior to refuge ownership using techniques that produced a structurally homogenous, relatively young forest landscape. This in contrast to a natural disturbance regime within spruce-fir characterized by small-scale disturbances: insect outbreaks (spruce budworm [*Choristoneura fumiferand*] and bark beetles [*Dendroctonus rufipennis*]) and wind storms recurring at intervals of several decades (Lorimer 1977, Seymour 1992). Unlike the commercial clearcuts that dominated softwood management in the Nulhegan, these disturbances are usually not stand replacing, and thus lead to the development of a wider range of age structures. The greater potential diversity in both species composition and age structure offers a broader array of habitats for refuge focal species.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes at the stand-level, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. Nulhegan Basin's spruce-fir forests should have all forest layers present and distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number

of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0 to 5 feet in height) created via group selection silviculture are of particular importance. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like rusty blackbird and black-throated green warblers. Improving vertical diversity of spruce-fir forests during management may provide an important habitat component for blackburnian warblers, who are canopy foragers who preferentially breed in forests with substantial cover taller than 60 feet (18 meters) (Morse 1976).

Dying, dead, and down trees are important components of forest ecosystems, because during the process of death and decay they are inhabited by an extraordinarily diverse succession of organisms ranging from woodpeckers and other cavity-users, to myriad invertebrates, fungi, and microorganisms. While studies examining snags and downed logs specifically in spruce-fir ecosystems are lacking, research in other forest types has shown timber extraction of the sort that impacted the Nulhegan's spruce-fir forests tends to minimize the number of snags and logs in a stand (Goodburn and Lorimer 1998, Fraver et al. 2002, Hura and Crow 2004). Our management efforts will explicit retain, or where appropriate create, dead wood. Generally, 2-4 large (defined as greater than 14″ DBH) snags per acre is thought to be adequate to maintain most wildlife populations.

Extensive and preferential removal of softwood species from the Nulhegan's mixed-wood stands is thought to have reduced the habitat quality of corridors linking large expanses of spruce-fir. Because the problems of forest fragmentation have been documented largely for small patches of forest surrounded by agriculture (REFS), it is not known how relevant these issues are in forested landscapes that have been fragmented by shifted species composition. Nevertheless restoring red spruce, eastern hemlock, and other softwood species to our mixed-wood stands in proportions closer to historical norms, will improve these corridors for species that may move between patches of spruce-fir forest, including white-tailed deer and American marten.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure.
- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition.
- Use forest management treatments (commercial and non-commercial) where and when appropriate to improve habitat. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.
- Ensure this habitat type provides effective winter shelter for wintering deer.
- Participate in the North Atlantic Landscape Conservation Cooperative efforts to develop climate change vulnerability assessment models.
- Work with partners and the USFWS New England Field Office to develop a lynx management plan for northern Vermont and New Hampshire, and evaluate the importance and role of habitats in the Nulhegan Basin CFA to lynx populations in the southern boreal forest.

*Within 10 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Promote stands dominated by early seral stages where appropriate to support nesting Canada warbler, rusty blackbirds, and Canada lynx.
- Promote stands dominated by late seral stages in the CFA interior to support blackburnian warbler,

including consideration of a refuge-designated "natural area" free from management actions.

- In managed stands, promote increased compositional and structural heterogeneity, including dense canopies, large-diameter trees, and large-diameter coarse woody debris and snags.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Continue to monitor Canada lynx populations in the CFA. For example, monitor Canada lynx with telemetry to determine home ranges, den sites, and other information.

- Map vernal pools and seeps.

*Within 10 years of CCP approval:*

- Conduct wildlife and habitat surveys to monitor temporal changes and trends resulting from management actions.

**Sub-objective 1.1b. (Hardwood Forests)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure for the diversity of species present, including American woodcock, black-throated blue warbler, and blackburnian warbler.

***Rationale:***
Again, there is a greater likelihood of meeting more species' requirements when more varied habitat conditions are present, and thus a higher degree of wildlife diversity can be expected (MacArthur and MacArthur 1961, Hunter Jr. 1990, Askins 2002, DeGraaf et al. 2006). And further, a traditional principle of ecology holds that diverse ecosystems are more stable than ecosystems that are less diverse (Elton 1958). This has important implications for climate change and wildlife conservation.

At the landscape-scale (here defined as the CFA) managing forests for diversity requires managing the patterns of succession that determine the age structure of the landscape. This is important for two reasons: (1) some successional stages have more species than others; and (2) each stage has a different, although not usually unique, set of species. In this discussion we refer to managing the age structure of the landscape, rather than managing succession, because the age of the forest stand is a reasonable index of its successional state.

Much of our forest management in our hardwood and mixed-wood stands will attempt to move the Nulhegan's forests toward an older condition. Biologists and managers have long recognized the ability of silviculture to create wildlife habitat structures (Tubbs 1977, DeGraaf et al. 1989), and more recent work has shown silviculture can create or accelerate the creation of late successional traits in northern hardwood forests (Keeton 2006, McKenny et al. 2006, D'Amato and Catanzaro 2009). While this will represent the largest proportion of our silviculture, we envision the hardwood forests within the CFA will include a variety of patches in different size classes and developmental stages. Species dependent upon disturbances that create early successional forested habitats, like American woodcock and Canada warbler, are declining as remaining patches of young forest mature (Askins 2001, Hallworth et al. 2008). Maintaining stands of young hardwood and mixed-wood forests adjacent to wetland areas have been shown to be important breeding habitat for Canada warbler (Hagan et al. 1997, Lambert and Faccio 2005). Enhancing the horizontal structure of hardwood and mixed-wood forests across the CFA should support other species of conservation concern like chestnut-sided warbler, American woodcock, black and white warbler and—if wetlands and riparian areas are in close proximity—Canada warbler (Lambert et al. 2005, DeGraaf et al. 2006, Reitsma et al. 2008, Chace et al. 2009).

Early successional hardwood and mixed-wood forest also serves as preferred habitat for American woodcock, a species in decline throughout the Connecticut River watershed. The Nulhegan Basin CFA is home to an approximately 260 acre Woodcock Management Demonstration Area. The American woodcock uses particular seral stages of northern hardwood forests, including younger stands dominated by shade-intolerant species like birch and aspen. Woodcock require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008).

Maintaining diversity across the landscape must include an adequate number and area of old forests simply because they represent one portion of the successional sequence, and especially because they represent what is likely to be the most biologically diverse portion of the sequence (largely due to tree bole users). Areas like the Nulhegan Basin CFA, where natural disturbance regimes are small-scale and relatively uncommon, old forests once dominated the landscape (Lorimer 1977, Bormann and Likens 1979, Cogbill 2000, Fraver et al. 2009). While we cannot return to a pre-European settlement forest, we can redress some of the imbalance currently within the CFA. Through a combination of silviculture aimed at restoring old-growth characteristics (Keeton 2004, D'Amato and Catanzaro 2007, Bauhus et al. 2009), long rotation systems and unmanaged areas we hope to create an important habitat condition missing from the spruce-fir forests of the Nulhegan. For example, we've identified approximately 189 patches of older spruce-fir forests (closed canopy of trees approximately 40 years old) ranging in size from <5 acres to more than 60 acres (Lapin and Engstrom 2002). By arranging long rotation stands to encircle a core of forests determined to possess late successional characteristics we can buffer these areas, significantly increasing its effective size. These efforts will aid a suite of species that include northern parula, bay-breasted warbler, black-backed woodpeckers, American martens, white-tailed deer, and boreal chickadees.

Ecologically sustainable management in northern hardwood and mixed-wood forests in the Nulhegan will ideally retain shade intolerants as the dominant species, and reduce the commonality of red maple in both broad forest types. Favoring shade tolerant, long-lived species like sugar maple and red spruce helps to stabilize the light environment in the understory, influence the texture and chemistry of forest litter, and provide habitat for numerous birds and mammals. The Nulhegan's red spruce appear to be vulnerable to temporary displacement by balsam fir and other fast-growing pioneer species (including red maple, trembling aspen, big-tooth aspen, and paper birch), particularly after preferential high-grading and disease (Frank and Bjorkbom 1973, Seymour and Hunter Jr. 1992, Bouchard et al. 2007). Its seeds are short-lived and do not persist in the soil seed bank (Blum 1990), making ascendancy to the canopy often dependent upon advanced regeneration. Individual longevity can be longer than 300 years, and is considerably longer than that of balsam fir (about 70 years). Red spruce is in documented decline in some parts of its range (Siccama et al. 1982; Adams and Stephenson 1989; Klein et al. 1991; Battles and Fahey 1995). Improving the representation of red spruce in the Nulhegan's mixed-wood stands will provide food and cover for various animals and birds. The spruce grouse feeds on the buds and foliage; red squirrels eat both the buds and seeds; varying hare species browse twigs and foliage; and porcupines feed upon the bark.

Our understanding of the forest structure within Nulhegan Basin comes from a forest-based habitat inventory conducted in 2007 (USFWS unpublished), aerial photo interpretation by contractors and a reading of the forest history within the Nulhegan Basin (Cogbill 2000; Gove 2003). Most of the hardwood and mixed-wood forests within the Nulhegan Basin CFA were harvested prior to refuge ownership using a combination of clearcutting and high-grading, resulting in a structurally homogenous, relatively young forest landscape. This in contrast to a natural disturbance regime characterized by catastrophic wind and ice storms, including hurricanes and cyclonic storms, thunderstorms, derechos, and tornados (Lorimer and White 2003). Unlike much of the forest management that has occurred within the CFA, these disturbances are usually not stand replacing, and thus lead to the development of a wider range of age structures. The greater potential diversity in both species composition and age structure offers a broader array of habitats for refuge focal species.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes at the stand-level, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. Nulhegan Basin's hardwood and mixed-wood forests should have all forest layers present and distributed throughout a stand and across the landscape: canopy, midstory, understory, and ground layer. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0 to 5 feet in height) created via group selection silviculture are of particular importance. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like Canada warbler and black-throated blue warbler. The black-throated blue warbler, prefers continuous tracts of mature forests dominated by deciduous tree species; a moderately open canopy; and a moderate to dense shrub layer (Morse 1994, Dunn and Garrett 1997, DeGraaf and Yamasaki 2001). Improving the diversity in canopy layers of hardwood and mixed-wood forests during management may provide an important habitat component for blackburnian warblers, who are canopy foragers who preferentially breed in forests with substantial cover taller than 60 feet (18 meters) (Morse 1976). Blackburnian warblers are one of six NALCC representative species for northern hardwoods. The Nulhegan Basin CFA falls within Bird Conservation Region 14, and supports 32 percent of the global population of black-throated blue warblers, making their conservation a priority.

Dying, dead, and down trees are important components of forest ecosystems, because during the process of death and decay they are inhabited by an extraordinarily diverse succession of organisms ranging from woodpeckers and other cavity-users, to myriad invertebrates, fungi, and microorganisms. Studies examining snags and downed logs specifically in hardwood and mixed-wood communities has shown timber extraction of the sort that impacted the Nulhegan's forests tends to minimize the number of snags and logs in a stand (Goodburn and Lorimer 1998, Fraver et al. 2002, Hura and Crow 2004). Our management efforts will explicit retain, or where appropriate create, dead wood. Generally, 2-4 large (defined as greater than 20″ DBH) snags per acre is thought to be adequate to maintain most wildlife populations.

Extensive and preferential removal of softwood species from the Nulhegan's mixed-wood stands is thought to have reduced the habitat quality of corridors linking large expanses of spruce-fir. Because the problems of forest fragmentation have been documented largely for small patches of forest surrounded by agriculture or suburban development (Gates and Gysel 1978, Wilcove 1985, Fahrig 2003), it is not known how relevant these issues are in forested landscapes that have been fragmented by shifted species composition. Nevertheless restoring red spruce, eastern hemlock, and other softwood species to our mixed-wood stands in proportions closer to historical norms, will improve these corridors for species that may move between patches of spruce-fir forest, including white-tailed deer and American marten.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Manage Woodcock Demonstration Management Units (WDMU) following the WDMU Plan.
- Use forest management treatments (commercial and non-commercial) where and when appropriate to improve habitat. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

*Within 10 years of CCP approval:*

- In managed stands, promote increased compositional and structural heterogeneity, including large-diameter coarse woody debris and snags.
- Stands with late seral characteristics should be conserved wherever they exist, and restored where appropriate within the CFA.
- Use management techniques that emulate natural ecological disturbances (e.g., single tree mortality in late seral stands).
- Enhance representation of more uncommon species, such as yellow birch and eastern hemlock, and conserve as much American beech as possible.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Map vernal pools and seeps.

*Within 10 years of CCP approval:*

- Conduct wildlife and habitat surveys to monitor temporal changes and trends resulting from management actions.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide foraging habitat for priority refuge resources of concern including American woodcock and American black duck. Priority will be to maintain the alder-dominated shrub swamps within the woodcock management units.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the Nulhegan Basin. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood-rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Shrub swamps in the CFA provide moist, rich soils for foraging and the dense shrubs provide cover from predators.

The woodcock management units in the CFA are being managed to provide the mosaic of habitat conditions that woodcock require. Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of the CFA woodcock management areas. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests in the vicinity of foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Manage WDMU following the WDMU Plan.
- Create and maintain alder in suitable density and size class to provide quality foraging habitat for American woodcock.
- Manage non-native plant species.
- Assess hydrology of wetland communities, evaluate impacts, and prioritize restoration opportunities.
- Manage beaver created shrub wetlands that provide brood habitat through annual modifications to the beaver trapping program.
- Protect rare or exemplary natural communities.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Monitor American black duck productivity, and use of shrub wetlands.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Peatlands)**
Manage peatland communities to support natural and rare ecological communities, and provide breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Peatland communities in the Nulhegan Basin CFA occur at the lower elevations. The groundcover in these peatland communities is dominated by sphagnum moss, and the vegetation is semi-treed or dominated by low shrubs, such as sheep laurel and Labrador tea. Sedges and grasses are common in the understory (Gawler 2008). There are several treed bogs in the Nulhegan Basin CFA, including the 75 acre Mollie Beattie Bog, which is among the most significant black spruce bogs in Vermont.

The peatlands that surround McConnell Pond, and those that occur along slow moving streams, including the Yellow Branch of the Nulhegan River, may provide important breeding and foraging habitat for American black duck, and other waterfowl species such as wood duck, mallards, and hooded mergansers. Wetland habitats, such as peatlands, are used by black ducks for breeding and foraging. Well-concealed nests are placed on the ground in adjacent uplands or dry hummocks in the wetland, and adult ducks and their broods forage on seeds and herbaceous vegetation of sedges, rushes, and submerged aquatic plants, as well as invertebrates (Longcore et al. 2000, DeGraaf and Yamasaki 2001).

American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these peatland wetland communities from potential threats, including invasive species introduction, and altered hydrology will contribute to the conservation of this species.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Protect rare or exemplary natural communities.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Continue to survey wildlife use of wetlands.

**Sub-objective 1.2b. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can

be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The biological integrity, diversity, and environmental health (BIDEH) policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Nulhegan Basin CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (i.e., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water Habitat)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and unimpeded aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and Atlantic salmon. Also provide undisturbed breeding and foraging habitat for American black duck, and other waterfowl species.

***Rationale:***
The Nulhegan River and three of its four major tributaries— the North, Yellow, and Black branches—flow through the Nulhegan Basin CFA. These cold water rivers provide important habitat for brook trout and Atlantic salmon. Both of these species are a high priority for conservation for the State and the Service's Northeast Region. Native brook trout populations are also present in Lewis and McConnell Ponds within the CFA.

Since the late 1800s, timber harvesting and associated activities have impacted riparian habitats within the Nulhegan Basin CFA. Rivers were reshaped; trees removed from river banks, and constructed logging roads impeded aquatic species passage. A change in stream habitat characteristics resulted, impacting fish populations. The refuge, Trout Unlimited, and the VFWD recognize the importance of restoring, protecting, and maintaining populations and habitats of brook trout and other aquatic species of concern. Efforts are underway to assess current habitat conditions, and prioritize restoration efforts.

VFWD also have concerns with the introduction and recruitment of smallmouth bass into Lewis Pond. Smallmouth bass prey on brook trout, and inventories have determined that brook trout populations are decreasing, while smallmouth bass populations are on the rise. Monitoring of Lewis Pond fish populations will continue, and appropriate management actions will be determined.

McConnell and Lewis Ponds, and the surrounding wetland habitats, are also important breeding and foraging areas for waterfowl species. Mergansers, wood ducks, mallards and black ducks forage on invertebrates and aquatic vegetation in backwater areas, and adjacent wetlands. Common loons are often found feeding on small fish in Lewis Pond, though breeding has not been confirmed.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Continue to support partners in performing stream assessments to evaluate physical, chemical, and biological condition of the Nulhegan Basin Division's fish community structure, productivity, and health; and support in-stream habitat restoration efforts.

- Continue to support partners in performing stream assessments to identify man-made physical barriers (impassable road crossings, culverts and dams) to movement of fish and other aquatic organisms, implement a remediation plan of identified obstacles to aquatic species passage. Work with partners to identify and replace undersized culverts important to the restoration of aquatic organism passage.

- In coordination with VFWD, develop and implement a plan for elimination of the non-native smallmouth bass in Lewis Pond.

*Within 10 years of CCP approval:*

- Develop a plan for protection or restoration of native races of brook trout in North Branch, Yellow, and Black Branches of Nulhegan River.

- Develop and implement a plan for remediation and enhancement of stream morphology (instream habitat) in support of brook trout and Atlantic salmon populations (e.g., recruitment of large woody debris).

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Perform habitat surveys and quantification of potential spawning and nursery habitat for Atlantic salmon in the Nulhegan River North, Yellow, and Black Branches.

*Within 10 years of CCP approval:*

- Assess status of brook trout populations, including genetic characteristics, in all waters of the Nulhegan Basin Division.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable to the Nulhegan Basin CFA*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable to the Nulhegan Basin CFA*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Work with communities, school systems, public and non-profit organizations, and private educational organizations to develop quality model environmental education curricula and to recruit and develop individuals to conduct high quality environmental education at the Nulhegan Basin Division. Priority will be given to programs for those residents within the communities local to the Nulhegan Basin Division, including, but not limited to Bloomfield, Brunswick, Ferdinand, and Brighton, VT, and North Stratford, NH. Further priority will be given to participants within a 1-hour commute of the division. Environmental education programs will be designed to:

- Take into account the needs of the target audience, as well as the relevance to the target audience's everyday lives.
- Be student and community-centered.
- Be curriculum-based, with goals and measurable objectives.
- Be inquiry driven and involve direct experiences with nature.
- Involve educators in the development and implementation.
- Be linked to multiple relevant learning standards.
- Coordinate with state and private environmental education programs.
- Relate to refuge management goals, objectives, and purposes.
- Have tools for evaluation and measurable outcomes throughout development and execution.
- Involve repeated contact with the same students.

- Be sustainable (i.e., have the resources necessary to continue over the long term).
- Involve interactions that occur in the natural, the built/developed, and the social environment.
- Aim to develop awareness, attitudes, understanding, skills, and feelings of empowerment.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

Because the Nulhegan Basin Division does not have full time visitor services staff, environmental education efforts must be conducted through volunteers, Friends members, and partners.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Design or adapt curricula for the Nulhegan Basin Division that focuses on watersheds, on local habitats, and on local natural and cultural resources. Curricula will:
  - ✓ Incorporate multiple relevant learning standards.
  - ✓ Coordinate with existing state and national environmental education programs.
  - ✓ Take into account student and teacher needs.
  - ✓ Be refuge- and/or place-based.
  - ✓ Incorporate nationally recognized education initiatives, when appropriate.
  - ✓ Be designed with specific goals and objectives.
  - ✓ Promote refuge purposes.
  - ✓ Contain consistent interpretive messages and themes.
  - ✓ Promote other refuge divisions and partner-conserved lands and facilities such as state wildlife management areas and parks, science museums, and nature centers as environmental education resources.
  - ✓ Incorporate nationally recognized initiatives (e.g., North American Association of Environmental Education (NAAEE), and Science, Technology, Engineering, and Math (STEM)).
  - ✓ Incorporate national based curricula (e.g., Project WILD, Project Aquatic WILD, Project WET, Flying Wild, and Project Learning Tree).
- Identify and strive to engage non-traditional audiences regarding environmental education opportunities.
- Support the Service's initiatives with regards to environmental education.
- Promote the Nulhegan Basin Division as a destination for field trips and increase the number of students by two percent per year for the next five years.
- Provide support for curriculum-based programs such as Scouts, 4H, Boys and Girls Clubs, Road Scholar (former ElderHostel program), etc.
- Support state environmental education programs (e.g., Hunter and Angler Education, Furbearer Education, Becoming a Great Outdoors Woman, etc.)

- Keep current with state-of-the-art technologies and incorporate them into environmental education programming.

- Work with academic institutions to create issue-oriented experiential activities and programs for use at the Nulhegan Basin Division.

*Within 10 years of CCP approval:*
- Offer the Nulhegan Basin Division as an outdoor classroom.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Develop an evaluation system to assess the effectiveness of all environmental education curricula.

**Sub-objective 2.1b. (Environmental Education Delivery)**
In collaboration with other government agencies, non-profit organizations, private educational organizations, staff, volunteers, and members of the Friends of the Nulhegan, offer high quality environmental education programs at the Nulhegan Basin Division, at partner lands and facilities, and at schools in Essex County, VT, and Coos County, NH. The refuge will seek to:

- Facilitate partnerships between local schools within a maximum 1-hour commute of the Nulhegan Basin Division, such as Brighton Elementary and North Stratford School and private environmental education providers to offer experiential refuge programming to these audiences multiple times per year.

- Facilitate the use of refuge and partner lands by educator-led classes.

- Work with local environmental education providers to implement the refuge's Adopt-a-Habitat initiative to help schools and individuals learn about and connect with natural features their local environments.

***Rationale:***
See rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 5 years of CCP approval:*
- Facilitate partnerships between local schools, such as Brighton Elementary and North Stratford School, and private environmental education providers to offer experiential refuge programming to these audiences multiple times per year.

- Use staff, volunteers, and members of the Friends Group to facilitate teachers and students at the Nulhegan Basin Division. The intention is to host up to 10 classes the first year and increase the number of students by 2 percent per year for the next 5 years.

- Promote partner lands and facilities as outdoor classrooms; help deliver priority educational programs at those partner facilities.

- Actively support and recruit partners that seek funding for watershed-based environmental education.

- Allow commercial guiding for the purposes of environmental education, pursuant to the conditions of a special use permit.

*Within 10 years of CCP approval:*
- Formalize cooperative relationships with environmental education providers through development of agreements and MOUs.

- Develop more detailed environmental education objectives and strategies as part of a Visitor Services Plan.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*
- Formally evaluate the quality of existing environmental education program and as a result of evaluation, plan for the next 5 years.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
Work with communities, public and non-profit organizations, private individuals and for-profit organizations, staff, volunteers, and members of Friends groups to offer quality interpretive programming at the Nulhegan Basin Division.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an expansive road network and multiple trails on site, and a rich natural, cultural, and geologic history, the Nulhegan Basin Division is well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the habitats and cultural resources found on the property. Interpreting the stories about these resources in an effective manner is an important responsibility for the Service. Maps A.56 and A.57 show the existing and proposed public use trails on the division.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.
- Collaborate with partners to create meaningful, consistent, thematic statements to be used in the delivery of programming at the Nulhegan Basin Division.
- Offer opportunities for commercially available interpretive guiding through the special use permit process.
- Develop more detailed interpretive objectives and strategies as part of a Visitor Services Plan.
- Develop a core set of interpretive programs that can be modified on an as needed basis.
- Provide resources and trainings to refuge staff, Friends, and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Establish relationships with tribes and local historical societies to incorporate cultural history into interpretive programs.
- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members and the general public, with priority given to refuge affiliates.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build a process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with partners to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through cooperative agreements with local organizations, annually provide quality interpretive programs at refuge facilities and properties.
- Initiate a "refuge host" program, or utilize SCA interns and volunteers to provide personal contacts at the visitor contact station to initiate discussion and answer questions, at least between Memorial Day and Labor Day.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge Web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures (e.g., general brochure and bird checklist that incorporate refuge interpretive messages and themes).
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of CCP approval:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Evaluate the effectiveness of interpretive materials/programs.

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

**Sub-objective 2.3a. (Local Residents, Community Leaders, and Elected Officials)**
Through effective outreach, the refuge will work to increase public awareness of the benefits of Nulhegan Basin Division within the surrounding communities. Individuals will become aware of public offerings, resources, and programs offered at the Nulhegan Basin Division, and of the interpretive messages of the Silvio O. Conte National Fish and Wildlife Refuge.

***Rationale:***
Strategic, quality outreach targeted at specific audiences is vital to communicate with individuals about watershed and refuge concerns, to work toward a shared vision for the Connecticut River watershed and to gain support for refuge activities. Nulhegan Basin Division lands were originally part of a much larger holding of industrial timber lands. Therefore, in addition to a differing land management philosophy, there are also some activities once allowed that have changed due to safety considerations, natural resource concerns, as well as, overall compliance with Refuge System regulations. As a result of that history, many local residents and long-time users are curious about possible changes and future planning for the area. It is critically important to keep people informed of all management and recreational activities occurring and proposed for Nulhegan Basin Division lands and to keep communication open to prevent misunderstandings.

**Management Strategies:**
*Continue to:*

- Prepare an annual summary of activities at the division and circulate to local governments, elected officials, partner organizations, and post for the general public.

- Continue to nurture a relationship with Brighton and Maidstone State Parks related to the cross-promotion of each facility's public offerings.

*Within 5 years of CCP approval:*

- Maintain good lines of communication with refuge neighbors and community leaders.
- Develop consistent outreach messages.
- Attend select board/board of governors and Chamber of Commerce meetings, and visit town clerks, planners and other elected officials as needed to keep them apprised of refuge issues and projects.
- Host open houses to introduce residents and local officials to the refuge.
- Provide refuge publications, posters, and other outreach materials to interested businesses and partner facilities in northern Essex County, whose customers may have an interest in refuge offerings.
- Write issue driven outreach plans to keep elected officials informed of refuge and partner accomplishments and of issues within the larger watershed that have possible impacts to the refuge.
- Proactively schedule consistent meetings with elected officials to share and update each other on constituent concerns and opportunities.
- Develop messages and actions that describe the division's benefits to the local community. Examples include: environmental education and interpretation programming, special events hosted for the community, employment for local youth through Youth Conservation Corps (YCC), mutual aid agreements, etc.
- Develop Conte Corners at the welcome centers in Island Pond and St. Johnsbury, Vermont.

*Within 10 years of CCP approval:*

- Develop and implement an outreach plan for communicating with area residents about the importance of this area to the larger watershed and describe how they can contribute to improving watershed quality. Possible components would include demonstration sites, behind-the-scene tours, special open houses, and technical publications.

**Sub-objective 2.3b. (State and National-level Elected Officials)**
Through effective outreach to Congress and State officials, as needed, the refuge will work to increase awareness of the benefits of Nulhegan Basin Division and the Silvio O. Conte National Fish and Wildlife Refuge.

***Rationale:***
See rationale for sub-objective 2.3a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Provide briefings to members of Congress and state officials, or their staff as needed or as requested.

*Within 10 years of CCP approval:*

- Monitor and evaluate the need for future outreach efforts.

**Sub-objective 2.3c. (Media)**
Through effective outreach to the media, the refuge will work to increase public awareness of the Nulhegan Basin Division and the Silvio O. Conte National Fish and Wildlife Refuge within the surrounding communities. Individuals will become aware of public offerings, resources, and programs offered at the Nulhegan Basin Division, and of the interpretive messages of the Silvio O. Conte National Fish and Wildlife Refuge.

***Rationale:***
See rationale for sub-objective 2.3a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Write press releases detailing large refuge projects and accomplishments, and the joint efforts and accomplishments of the refuge and refuge partners.
- Develop and implement an outreach plan that uses state of the art technology to disseminate program information and division offerings to the public.
- Host local media representatives at the Nulhegan Basin Division.
- Routinely use community-based outreach methods, such as newspapers and local access television to publicize refuge events and run public service programming on environmental issues.

*Within 10 years of CCP approval:*

- Monitor and evaluate the need for future outreach efforts.

**Sub-objective 2.3d. (Greater Watershed Community)**
Through effective outreach, the refuge will work to increase public awareness of the Nulhegan Basin Division and the Silvio O. Conte National Fish and Wildlife Refuge within the greater watershed communities. Individuals will become aware of public offerings, resources, and programs offered at the Nulhegan Basin Division, and of the interpretive messages of the Silvio O. Conte National Fish and Wildlife Refuge.

***Rationale:***
See rationale for sub-objective 2.3a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Encourage landowners to take advantage of cooperative land management programs available through the Service and other agencies such as Natural Resources Conservation Service (NRCS) as a way of enhancing environmental quality on and around the refuge.
- Draft annual reports that introduce residents to the refuge, describe refuge accomplishments, detail visitor opportunities, and discuss refuge operations and current and future refuge projects.
- Implement an Adopt-a-Habitat program to be used in part as an outreach tool for schools and community residents to learn about and become stewards of their local environment.
- Promote the refuge as a destination for recreation, interpretation, and environmental education opportunities.
- Promote refuge lands for special events such as National Wildlife Refuge Week, International Migratory Bird Day, Earth Day, etc.
- Use the WoW Express as an outreach tool to connect with audiences throughout the watershed at fairs, festivals, etc.
- Support the Friends of the Nulhegan.
- Provide outreach materials at partners' facilities.
- Promote cooperation with partners for the use of facilities, programs, and staff when conducting outreach.

*Within 10 years of CCP approval:*

- Produce conservation messages that reach a wide range of audiences through a variety of media (e.g., print, broadcast, social media).
- With partners, explore communication strategies to reach targeted audiences with common messages.

- Sponsor at least one Bio Blitz on refuge lands in each state, and ultimately in each division/or local community in conjunction with Adopt-a-Habitat program.
- Monitor and evaluate the need for future outreach efforts.

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

**Sub-objective 2.4a. (Institutions of Higher Learning and Other Partners)**
Develop relationships with institutions of higher learning and other partners conducting conservation research relevant to the Division's focal species such as the University of Vermont and Lyndon State College, and private organizations, such as the Vermont Institute of Natural Science and Vermont Center for Eco-studies and encourage their use of refuge lands for wildlife-related research. Take advantage of partners' scientific based resources and enlist partners in Strategic Habitat Conservation and other resource protection activities.

***Rationale:***
One of the six legislative purposes guiding the establishment of the Silvio O. Conte National Fish and Wildlife Refuge is "to provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access to the extent compatible with other purposes . . ." The Nulhegan Basin Division is actively managed and roughly one hour from Lyndon State College, while the University of Vermont is two hours away. The abundance of natural and cultural resources in the local area makes the Nulhegan Basin Division a key resource for students looking for mentoring experiences, and for students looking to conduct research projects relating to conservation, wildlife management, resource protection, and human dimensions. Similarly, student research will benefit the refuge by answering management questions, and helping to guide management strategies.

**Management Strategies:**
*Continue to:*

- Work with partners to conduct research relevant to refuge management issues.
- Support the Northern Forest Land Management Research Demonstration (LMRD) project by actively participating in planning efforts and implementing appropriate land treatment efforts.
- Implement the American woodcock habitat demonstration project.

*Within 5 years of CCP approval:*

- Formulate a list of important natural resource research questions of management importance to the Division and Northern Forest and share them with colleges and universities as possible graduate and undergraduate research projects.
- Develop formal agreements with Cooperative Wildlife Research Units, universities, and other partners to answer the Conte Refuge's most critical research needs.
- In collaboration with the Friends of Conte, seek funding for high priority research.

*Within 10 years of CCP approval:*

- Support the development of new appropriate research projects on refuge lands, as well as continue to support current research projects on refuge lands. See chapter 3 in the draft CCP/EIS for a description of current research projects.
- Identify opportunities for LMRD projects on lands adjoining the Division.
- Promote refuge lands to universities and other partners as a location for conservation and cultural resource-related research.

**Sub-objective 2.4b. (Technology and Information Exchange)**
Participate, coordinate, and/or host professional conferences, workshops and seminars related to wildlife biology, wildlife management, environmental education and interpretation at the Nulhegan Basin Division.

***Rationale:***
See rationale for sub-objective 2.4a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Encourage staff to participate in relevant, natural and cultural resource conferences that will contribute to making good decisions.
- Distribute 'lessons learned' from refuge management to interested parties.
- Provide inventory and monitoring summaries through the refuge Web site.

*Within 10 years of CCP approval:*

- Sponsor/host science based conferences as opportunities arise.

**Sub-objective 2.4c. (Mentoring)**
Provide quality mentoring opportunities for local students and interested individuals.

***Rationale:***
See rationale for sub-objective 2.4a.

**Management Strategies:**
*Continue to:*

- Host a YCC crew and spend staff time with members informing them of refuge job duties and career options within the Service.

*Within 5 years of CCP approval:*

- Offer student internships and host field trips.
- Offer to periodically present refuge and career information to classes at local high schools and colleges.
- Seek opportunities to participate in student workshops, trainings, and events.

*Within 10 years of CCP approval*

- Develop a mentoring program to work with students to help them identify their career goals and introduce career paths within the Service.
- Participate in undergraduate and graduate level classes at local universities and colleges, presenting information on various topics and issues of importance to the refuge.

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

The Nulhegan Basin Division's lands are open to the public 24 hours a day, 7 days a week. A network of snowmobile trails provides winter access. The road network is gated to wheeled vehicles during spring mud season, which usually lasts from mid-April through late May. During this time, only pedestrian access is allowed.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following State- and refuge division-specific regulations.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. The Nulhegan Basin Division has been a popular area for hunters extending back for generations. The refuge lands are especially prized for the opportunities to hunt American woodcock, ruffed grouse, snowshoe hare, moose, and white-tailed deer. Some of these species, especially woodcock, grouse, and moose, are hunted by residents as well as, non-residents, many of whom travel to the area from other northeastern states, while white-tailed deer, grouse, and snowshoe hare are more sought after by local residents and the camp leaseholders and their friends who maintain cabins both on the refuge and surrounding lands. Hunting guides can aid the local economy and enhance a users' experience, especially for those individuals from outside the immediate area. Refer to Appendix D, "Findings of Appropriateness and Compatibility Determinations," for additional details on how the use would be allowed.

**Management Strategies:**
*Continue to:*

- Allow hunting based on VFWD regulations and the following division-specific regulations:
  - ✓ Shooting across, over, or within 10 feet of the traveled portion of any gravel road is prohibited.
  - ✓ Temporary blinds are permitted, but must have the owner's name and address visible on the blind.
  - ✓ All decoys, shell casings, and other personal equipment and refuse must be removed from the refuge at the end of each day.
  - ✓ We allow the use of retrieving dogs, but dogs must be under voice command at all times.
  - ✓ We prohibit the use of all-terrain vehicles (ATVs or OHVs).
  - ✓ The use or possession of alcoholic beverages while hunting is prohibited.
  - ✓ Nighttime raccoon hunting with dogs requires a special use permit.

*Within 1 year of CCP approval:*

- Update the refuge-specific CFR regulations to clarify that the prohibition on shooting across "the traveled portion of any gravel road" only applies to roads that are contemporaneously open to motor vehicles.
- Update the refuge-specific CFR regulations to note that any nighttime hunting will require a special use permit.
- Maintain a contact list of those individuals training and/or hunting with pursuit hounds (bobcat, bear, coyote) on the refuge, as well as those training beagles in order to share information regarding the identification of lynx and their sign and proper conduct when lynx are present (e.g., leashing and removing hounds from the area) as well as a means to contact users immediately should critical information become available (e.g., the discovery of a lynx den).
- Request that the VFWD promote hunting by featuring refuge opportunities in their annual hunting and fishing digest; also use the digest to describe any refuge-specific regulations.
- Ensure any necessary safety zone (i.e., no hunting zone) around the division's headquarters and visitor contact station are clearly marked on refuge brochures, hunt maps, and signs.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

*Within 5 years of CCP approval:*

- Complete hunting opening package to formally open newly acquired lands to hunting, consistent with compatibility determinations.
- Work with the VFWD to determine whether opportunities exist for state-recognized disabled hunters, and if so, identify potentially new infrastructure needs.
- Mow 1 mile of former logging haul road annually to provide enhanced hunter access.
- Mow roadside "pullouts" on a 2 to 3 year rotation to allow enhanced hunter access.
- Offer opportunities for commercial hunting guides to operate on the division through the issuance of a special use permit.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with VFWD to evaluate the effectiveness and success of the refuge hunt program in contributing to State population objectives.
- Develop a system to monitor and evaluate the hunting program; involve hunters and other users in collecting feedback; determine whether refuge management objectives are being met; and allow for adaptive management.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide State-sponsored hunter education classes access to the Nulhegan Basin Division. Conduct directed outreach to ensure hunters are informed about refuge-specific regulations, hunter ethics, and safety considerations. Develop programs, including brochures, web pages, media releases, etc.

***Rationale:***
Hunting is a priority public use that can also serve as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience. The division's visitor contact station and its surrounding grounds provide an ideal setting for this type of instruction. In addition, the meeting space and grounds can also be used for complete onsite archery programs, directed by volunteers, with staff support.

**Management Strategies:**
*Continue to:*

- Work with VFWD to inform hunters of the field identification differences between bobcat and federally threatened Canada lynx, and ruffed grouse (i.e., partridge) and the State-endangered spruce grouse with flyers at division kiosks, the refuge Web site, etc.
- Offer to host VFWD-sponsored hunter education courses at the division's visitor contact station.

*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at Nulhegan Basin Division informational kiosks, through the Friends of the Nulhegan, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Work with VFWD to encourage youth hunting at the division as a means of introducing young people to hunting.
- Offer division facilities and staff to guide and support volunteer "Becoming a Bowhunter"- type programs.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Nulhegan Basin Division. Complete all administrative procedures to officially open refuge lands to fishing, based on VFWD regulations, and any division-specific conditions.

***Rationale:***
Fishing is a priority public use on national wildlife refuges and a popular outdoor recreational activity. The division has been open to fishing since establishment and we propose to continue to offer this use. Although fishing is not as popular as hunting or wildlife observation at the Nulhegan Basin Division, there are opportunities for visitors to fish Lewis Pond and the Black and North Branches of the Nulhegan River. Fishing guides can aid the local economy and enhance a users' experience, especially for those individuals from outside the immediate area. Most anglers seek out brook, brown, and rainbow trout, although Lewis Pond had been stocked illicitly with smallmouth bass in the past. Each year, the VFWD stocks Lewis Pond with roughly 2,000 fall fingerling brook trout and the Black Branch of the Nulhegan River with approximately 100 yearling brook trout. They also stock the main stem Nulhegan River with 100 yearling brook trout, which can easily make their way into the refuge. Map A.52 shows proposed fishing access points.

**Management Strategies:**
*Continue to:*

- Provide the opportunity for a quality fishing experience on ponds, rivers, and streams at the Nulhegan Basin Division, wherever feasible.

*Within 1 year of CCP approval:*

- Complete all administrative requirements to maintain fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Publicize the access and fishing opportunities provided to anglers via the newly opened North Branch Trail.
- Open newly acquired lands to fishing, consistent with the final approved compatibility determination.

*Within 5 years of CCP approval:*

- Work with the VFWD to develop additional fishing access points for the North and Black Branches.
- Work with VFWD to explore restoring a native cold-water trout fishery to Lewis Pond, including outreach to camp leaseholders and visitors about the consequences of introducing bass. Any pond-wide reclamation effort involving the use of chemicals would adhere to all Service, Federal, and State environmental regulations.
- Offer opportunities for commercial fishing guides to operate on the division through the issuance of a special use permit.
- Assess user interest in an ADA-compliant fishing access site at Lewis Pond or McConnell Pond (subject to Service acquisition).

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the fishing program; involve anglers and other users in collecting feedback; determine whether refuge management objectives are being met; and allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, Web site pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Both the VFWD and Trout Unlimited are important partners. Opportunities exist to work with both of these entities to develop a closer link to the neighboring communities with fishing by creating fishing maps and publications and hosting fly-tying, fly-casting, or other fishing-related seminars at the visitor contact station.

**Management Strategies:**
*Continue to:*

- Offer the visitor contact station as a site to host fly-tying and other fishing-related seminars. Focus on expanding efforts to engage women and children.

*Within 1 year of CCP approval:*

- Inform the VFWD and private partners of the availability of the visitor contact station to host a "Take Me Fishing" event.

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

*Within 5 years of CCP approval:*

- Work with the VFWD and Trout Unlimited to highlight the native brook trout fishery on the division.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Nulhegan Basin Division by maintaining existing and proposed trails and parking areas, watercraft launch sites, tour routes, and commercially guided activities, as compatible.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity at the Nulhegan Basin Division. The division's landscape is vast, with nearly unlimited wildlife viewing opportunities, although unlike many refuges, its formal infrastructure is both limited and rustic. Moose is perhaps the single most desired animal for wildlife viewing. The division also hosts nearly 100 species of nesting birds, principally, forest-dependent songbirds, and the woods are alive with their songs during the May—June breeding season. In particular, experienced bird watchers are drawn to the Nulhegan Basin Division for the opportunity to view four boreal species typically found much further north: spruce grouse, black-backed woodpecker, gray jay, and boreal chickadee. Currently, visitors can travel the nearly 40 miles of gravel roads, five miles of developed hiking trail, and dozens of miles of old logging roads to pursue wildlife observation and photography opportunities.

User groups with an existing presence in the area requested certain infrastructure additions, such as a hiking trail originating at the Lewis Pond Overlook, a riverside campsite on the Nulhegan River below the visitor contact station, and a canoe/kayak launch at the junction of the Nulhegan River and Route 105. In all cases, these

improvements build on and encourage use of existing infrastructure, provide additional visitor opportunities to observe and experience wildlife in a variety of forms, and offer a means to connect varied audiences with the refuge and National Wildlife Refuge System. In addition, three rustic fishing access sites, consisting of a signpost and footpath, are proposed as a means of showing visitors with little knowledge of the division, potential fishing locations. A rustic "backcountry" trail loop is proposed as a means of incorporating existing logging haul roads into a trail without the amenities found on the other division trails, thereby providing a slightly different experience for bird watchers and as an access point for hunters. Lastly, if the McConnell Pond tract is acquired as proposed, the road leading to McConnell Pond will be opened to the public and maintained as a primary road, and a car top boat launch will be established.

**Management Strategies:**
*Continue to:*

- Allow wildlife observation and photography throughout the Nulhegan Basin Division.
- Maintain the current visitor infrastructure including the Nulhegan River Trail, North Branch Trail, Mollie Beattie Bog Boardwalk, Headquarters Overlook, Lewis Pond Overlook, kiosks, and parking areas.
- Invest a majority of our road maintenance funds in our principal road network (Stone Dam, Canal, Eagle's Nest, Upper Lewis Pond, Lewis Pond Overlook, and Four Mile Roads), such that they are accessible to a wide range of visitors, including those with passenger cars and trucks.
- Support Northeast Kingdom Audubon's public bird watching trips.

*Within 1 year of CCP approval:*

- As an enhancement to the visitor experience and as an aid to the local economy, allow for professionally guided wildlife tours, subject to compatibility and a special use permit.
- Allow photography blinds on the division that do not negatively impact wildlife behavior. Blinds must be removed each day, unless arrangements have been made via special use permit.

*Within 5 years of CCP approval:*

- Construct a 1.3 mile native surface loop trail (0.5 miles of which is existing, cleared trail) with its trailhead at the Lewis Pond Overlook. The trail will be built to the "rustic" standards found elsewhere on the surrounding publicly accessible lands, with minimal vegetation clearing.
- If interest exists, convert 4.2 miles of primarily former logging roads to a "back country" trail that is minimally maintained (i.e., native surface, no structural improvement, only vegetation trimming), and have limited signage.
- Offer opportunities for commercial wildlife observation guides to operate on the division through the issuance of a special use permit.

*Within 15 years of CCP approval:*

- Evaluate feasibility of providing safe motor vehicle access from McConnell Pond Road (if acquired by the Service) to serve as a second, direct access point to the division. This will require sufficient funding to rebuild one to two miles of road and construct a new bridge.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the wildlife observation and photography program on the refuge.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people that visit the division. Work closely with the Friends of Nulhegan and other partners who host events designed to view wildlife on the division.

***Rationale:***
The entire division is available for wildlife observation and photography. A modest amount of printed and electronic observation and photography aids currently exist, but such materials can be expanded to include a wider range of wildlife and habitats. Whenever possible, we will try to use new technologies to help enhance viewing opportunities on the refuge (e.g., online materials, social media sites, applications for mobile devices). Unfortunately, much of this is dependent on cell phone coverage, which is poor within the division. Should service improve in the next decade, this can be a valuable tool for informing the public across a large landscape in a self-directed way.

**Management Strategies:**
*Continue to:*

- Provide the Nulhegan Basin Division bird guide at kiosks, the visitor contact station, and on the refuge Web site.

*Within 5 years of CCP approval:*

- Create additional species guides, such as guides for butterflies and moths, amphibians, and mammals. Include a map within the guides that identifies "hotspots" where viewing opportunities are more likely and also encompass varied habitat types. Make these guides available at kiosks, the visitor contact station, and on the refuge Web site. Explore the feasibility of using social media to distribute species lists.

- Support wildlife observation events led by partners, organizations including International Migratory Bird Day, Big Sit, etc.

*Within 10 years of CCP approval:*

- Explore the feasibility of using cell phone technology to advance a users' experience, such as phone applications, QR codes, or calling codes that would enable visitors to learn about various natural features while on the division.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
Develop compatible opportunities on Nulhegan Basin Division that promote state and watershed-wide initiatives that facilitate wildlife observation and photography, such as the Connecticut River Birding Trail and state roadside wildlife viewing areas, and which raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
The Nulhegan Basin Division's visitor contact station hosts more than 4,500 visitors annually. Many of these visitors are from outside the local area and are looking for accessible wildlife viewing opportunities.

**Management Strategies:**
*Continue to:*

- Promote the Connecticut River Birding Trail by emphasizing the Nulhegan Basin Division as one of the featured locations and by making the guides available at the visitor contact station.

*Within 1 year of CCP approval:*

- Make guides and published materials supporting the Connecticut River Byway and the Connecticut River Blueway available at the visitor contact station.

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities)**
Develop compatible opportunities on the Nulhegan Basin Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
The division benefits directly with the Nulhegan River's inclusion in the Northern Forest Canoe Trail, a 740-mile water trail from upstate New York to Maine. Hundreds use the trail each year; some are "through" paddlers, while others paddle shorter sections of less than a day to several days. The division has the opportunity to connect with this user group by making the visitor contact station and the division's other resources available to them. Map A.58 shows the proposed Northern Forest Canoe Trail campsite and a proposed canoe/kayak launch site on the division.

The Connecticut River Paddlers' Trail passes through Bloomfield, Vermont, six miles from the visitor contact station. This is a relatively new initiative with the ambitious goal of creating a formal water trail, with launching areas and campsites for the 410-mile length of the Connecticut River. There are benefits to partnering with this organization given the likely overlap in user groups.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Support the Northern Forest Canoe Trail and Connecticut River Paddlers' Trail by offering their literature to the public at the visitor contact station.

- Allow the Northern Forest Canoe Trail to construct canoe/kayak launching and landing sites (floating log ladder or stone water-land transition area) on the Nulhegan River:

  (1) Below the visitor contact station to support access to a proposed campsite.

  (2) At the Nulhegan River/Route 105 crossing near Stone Dam Road to formalize an existing launching site adjacent to a state-maintained parking area. In addition to construction and on-going maintenance, the Northern Forest Canoe Trail would be responsible for obtaining any necessary permits.

- Allow the Northern Forest Canoe Trail to construct a primitive campsite and 500-foot native surface trail linkage from the Nulhegan River Trail to support long-distance paddlers and to establish a physical link between the water trail and the refuge via its visitor contact station. The campsite will include a cleared space for up to two tents, a picnic table, and a privy. The Northern Forest Canoe Trail's local river steward will be responsible for site maintenance. Refer to Appendix D, "Findings of Appropriateness and Compatibility Determinations," for additional details regarding use of the campsite.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities)**
Develop compatible opportunities on the Nulhegan Basin Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
The Nulhegan Basin Division's size, road network, and proximity to regional trails present several opportunities to link with other existing land-based trails. The division is an important "hub" within the Vermont Association of Snow Travelers (VAST) snowmobile trail network in northern Essex County. Snowmobiling in this area preceded establishment of the division and continues to be a significant means of allowing the public access to the division's resources during a quarter of the year. Although snowmobiling accounts for the greatest amount of public use, the visitor contact station is only lightly used during winter; such use could increase significantly provided a connection to the trail network is established. The division's lands also offers connections to regional hiking and potentially, equestrian trails. Map A.57 shows the proposed snowmobiling network on the division.

**Management Strategies:**
*Continue to:*

- Work with VAST to maintain and operate a snowmobile trail system on the division that provides opportunities to experience the division's habitats and wildlife, while also retaining important trail connections across the larger network. Virtually all of this network will overlay existing gravel roads. A 35 mph speed limit will be enforced. Refer to Appendix D, "Findings of Appropriateness and Compatibility Determinations," for additional details on how the use would be allowed.

*Within 1 year of CCP approval:*

- Allow VAST to construct an access trail to the visitor contact station, so that the thousands of annual snowmobilers will benefit from the exhibits and other services available at the contact station. This would entail building a 1.4-mile spur primarily across Plum Creek Timber Company lands and would therefore require the approval of Plum Creek and the Vermont Land Trust. Less than 500 feet of the new trail would occur on refuge land.

  ✓ In order to compensate for the proposed 1.4 miles of new trail construction, approximately 2.0 miles of existing trail segments will be closed:

    ✳ Trail 114 between EX27 and EX271 (0.9 miles of "winter" or "grass" road) and approximately 1.1 miles of secondary trail C102/114 between EX22 and EX32 (one-half of a small loop) on the McConnell Pond tract (if acquired by the Service).

    ✳ Such closures will only be implemented if and when the proposed new trail is completed and open to the public.

- Open snowmobile trails to pedestrian uses, such as snowshoeing and cross-country skiing, as is similar to adjacent public lands.

- Partner with the Green Mountain Club to construct a 1.4-mile hiking trail segment to incorporate the division into their Gore Mountain Trail. This trail would originate at the Lewis Pond Overlook parking area and much of it would occur on Plum Creek Timber Company lands and would therefore require the approval of Plum Creek and the Vermont Land Trust. It will be built to a standard similar to other regional hiking trails, with a mineral soil tread and minimal vegetation clearing.

*Within 5 years of CCP approval:*

- If acquired by the Service, formalize a portion of the VAST network on the McConnell Pond tract as part of the established refuge network, subject to the compatibility determination findings.

*Within 15 years of CCP approval:*

- Evaluate whether refuge lands can form a continuous connection with the established equestrian trail on West Mountain Wildlife Management Area. If found appropriate and compatible, a portion of the division's gravel road network would be incorporated into the larger trail system.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**

Allow compatible outdoor recreational opportunities on the Nulhegan Basin Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***

In addition to the priority public uses, there are other appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division. Maps A.56 and A.57 show the proposed public use infrastructure on the division.

**Management Strategies:**

*Continue to:*

- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.

- Allow hiking both on and off the developed trail network.

- Allow occupancy and use of private recreational cabins on existing division lands subject to the terms of the established special use permit.

*Within 1 year of CCP approval:*

- When compatible, allow commercial guiding in support of priority public uses by special use permit.

- Allow snowshoeing and cross-country skiing everywhere on the division, including the VAST snowmobile network.
- Allow bicycling on the formal gravel road network (i.e., those named roads available to motor vehicle travel) during the snow-free season.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.

*Within 5 years of CCP approval:*

- Work with the Friends of Nulhegan to design and promote a virtual geocache course that integrates orienteering with refuge interpretive messages and that links the Nulhegan Basin Division to other refuge divisions.
- If the Service acquires the McConnell Pond tract, establish a special use permit for administration of any private recreational cabins acquired along with the tract. Similar to existing cabins on the division, those cabins occurring on the McConnell Pond tract will follow the same special use permit conditions (refer to appendix D) and leases will also terminate no later than July 21, 2049, pending negotiations with the current landowner.

# Overview
# Ompompanoosuc Conservation Focus Area (Proposed)

## Vershire, Fairlee, and West Fairlee, Vermont

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 15,071 | 98.0 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *15,071* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 312 | 2.0 % |
| Total Acres in CFA[2, 4] | 15,383 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The proposed Ompompanosuc CFA is part of a larger high priority area for the State of Vermont because it is a relatively large, contiguous, block of northern hardwood forest and its importance to interior forest birds. There are several nearby conserved lands, including the Bradford and Fairlee Town Forests. However, the area is currently largely unconserved and Service land acquisition in the area could help fill this gap. Also, the proposed CFA is expected to be resilient to climate change.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 86.4%
- Shrub Swamps and Floodplain Forest – 0.8%
- Freshwater Marsh – 0.6%

See map A.61 and table A.43 for more detailed habitat information for the CFA.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.44 below, there are fourteen Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to various documented State Species of Greatest Conservation Need (SGCN), and to species that require large contiguous forest tracts such as forest interior dwelling bird species. These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor for bird species. The lower portion of the watershed (CT and MA), and habitats along the main stem, receive higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Ompompanoosuc CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

This CFA is mostly forested, the topography steep in places, with elevations rising above 2,200 feet. The cliff and talus systems are used by nesting peregrine falcons, a Priority Refuge Resource of Conservation Concern and State Species of Greatest Conservation Need. Bald eagles and osprey, also PRRC and SGCN, take advantage of the open water on Lake Fairlee and the Connecticut River, and nest in supracanopy trees within the CFA. The unfragmented forests provide breeding habitat for species of conservation concern and forest interior dwelling species, including PRRC such as wood thrush, blackburnian warbler, Canada warbler, chestnut-sided warbler, and American woodcock.

2. **Waterfowl**
   There is potential breeding and foraging habitat for American black duck, a PRRC species, wood duck, Canada geese, and other waterfowl species within wetlands associated with slow moving streams and open water habitats.

3. **Diadromous fish and other aquatic species**
   The Ompompanoosuc River, and a few brooks and small ponds occur in the Ompompanoosuc CFA. The Ompompanoosuc River occurs in the western portion of the CFA where it flows southeast through Eagle Hollow and West Fairlee to the Connecticut River main stem. A few small streams in the CFA flow into the Ompompanoosuc River, while Blood Brook and Middle Brook flow into Lake Fairlee, located outside of the CFA's southern boundary. These water resources provide high quality cold water habitat for PRRC species, including brook trout and Atlantic salmon. These species are a high priority for conservation in the State and within the Service's Northeast Region. Other species that may occur in the Ompompanoosuc River CFA include creek chub, white sucker, slimy sculpin, and blacknose dace.

   The Ely Copper Mine is less than a mile from the Ompompanoosuc CFA in Vershire, and is listed by the U.S. Environmental Protection Agency as a superfund site. Elevated metal and sulfide concentrations have affected nearby and downstream water resources, and the EPA has implemented a cleanup plan for portions of this site (U.S. Environmental Protection Agency 2013). Contamination of CFA habitats has not occurred, though the lower reaches of the Ompompanoosuc River has shown negative consequences. Providing healthy ecosystems within the CFA will assist with mitigating impacts from this superfund site.

4. **Wetlands**
   The Ompompanoosuc River CFA contains 109 acres of conifer swamp, 126 acres shrub-swamp, and floodplain forest, and 88 acres of freshwater marsh. Many of these wetlands are associated with slow moving streams or small ponds. Patch size ranges from 2 acres to over 80 acres.

5. **Other**
   The Ompompanoosuc River CFA southwestern boundary is less than a mile from the abandoned Ely Copper Mine. Over eight hundred bats have hibernated in this mine before the presence of white-nose syndrome, including little brown bats, northern long-eared bats, tricolored bats, eastern small-footed and big brown bats. A survey by Vermont Fish and Wildlife in 2013 showed a drastic decline in bats, with just under 200 present (Darling personal communication). Little brown and northern long-eared bats were hit the hardest from white-nose syndrome. Northern long-eared bats were recently listed as federally threatened. Little brown bats, as well as the tricolored and eastern small-footed bats, are undergoing review for listing under the ESA, and therefore are a PRRC. Little brown bat and tricolored bat are currently being assessed for candidate status, and eastern small-footed bat have been petitioned for listing under the ESA. Although this hibernaculum is less than a mile from the CFA boundary, the habitats within the CFA are still significant for roosting, feeding and for potential maternity sites

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

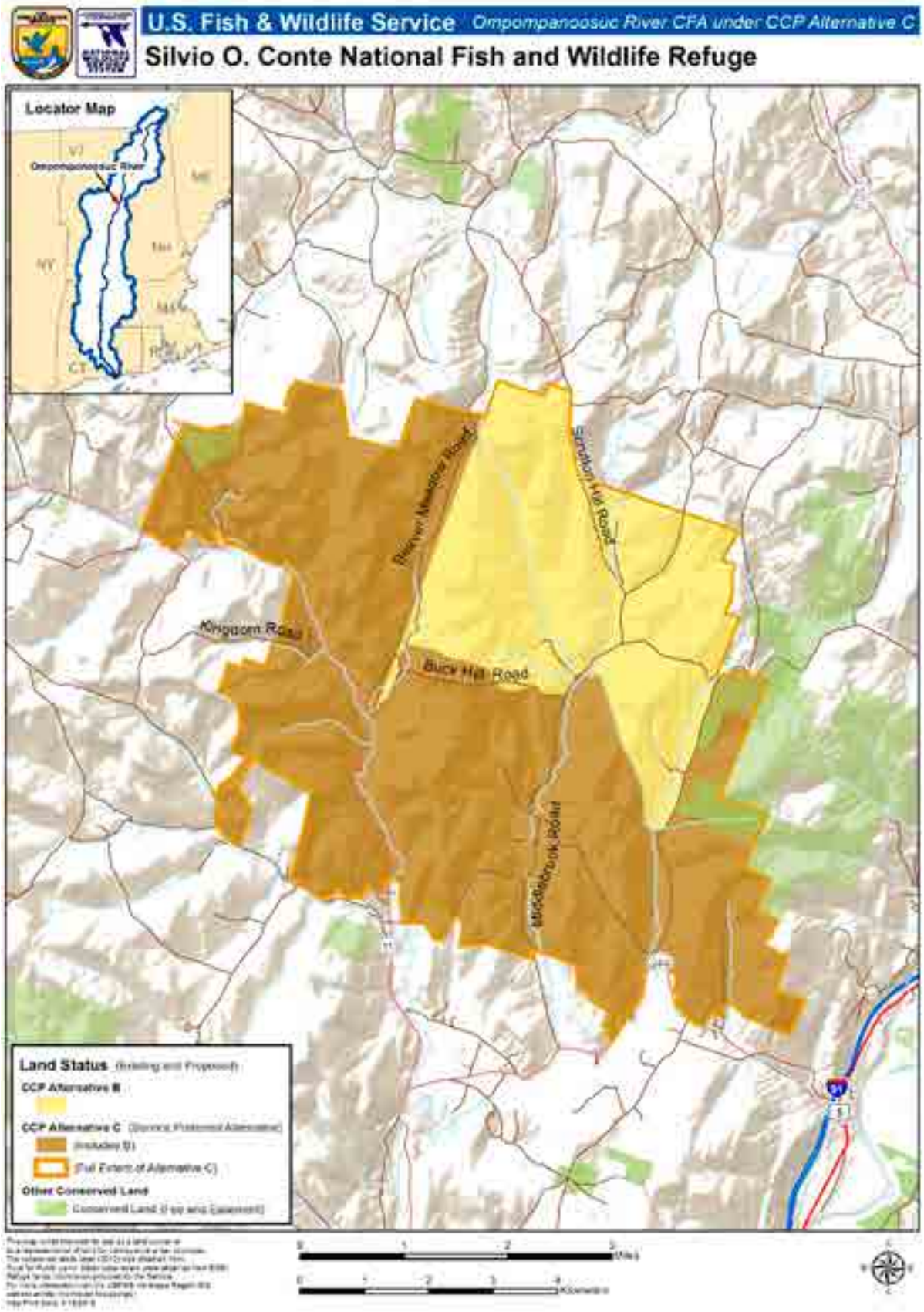
We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse (different size classes) and native species will dominate.
- We will conduct management activities in wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.
- In open water (stream, rivers, ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and uninterrupted aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

The National Wildlife Refuge System Improvement Act of 1997 identified hunting, fishing, wildlife observation, photography, interpretation, and environmental education as priority, wildlife-dependent uses. As such, these uses would receive priority on refuge lands.

*Map A.60. Ompompanoosuc CFA – Location.*



*Map A.61. Ompompanoosuc CFA – Habitat Types.*

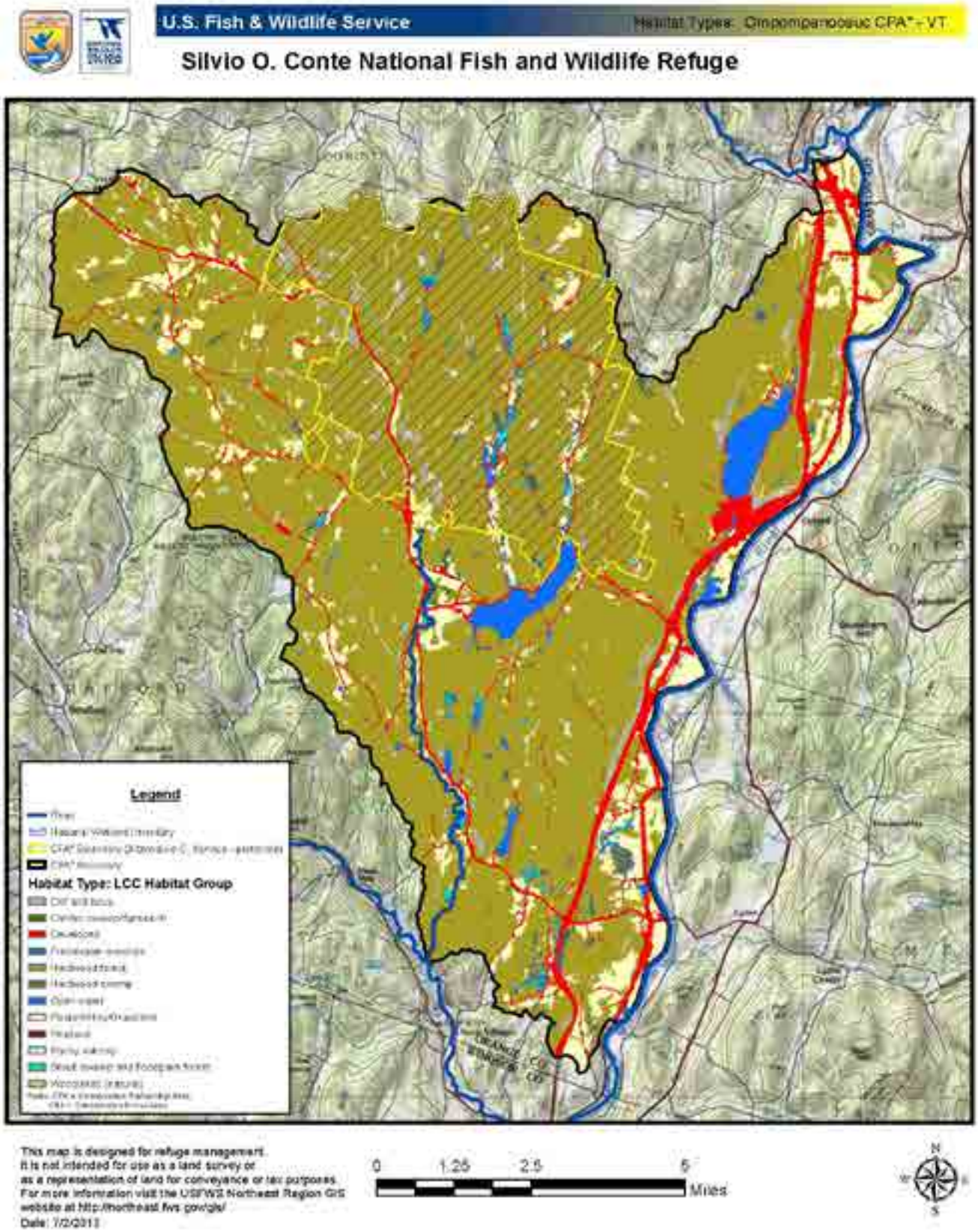


**Table A.43. Ompompanoosuc CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 458 | 0.7% | 109 | 0 | 0 | 0.7% | 23.8% |
| Hardwood forest | 47,680 | 76.5% | 13,282 | 280 | 0 | 86.4% | 27.9% |
| Hardwood swamp | 152 | 0.2% | 0 | 0 | 0 | 0.0% | 0.0% |
| Shrub swamp and floodplain forest | 415 | 0.7% | 126 | 0 | 0 | 0.8% | 30.3% |
| Woodlands (natural) | 88 | 0.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Forested uplands and wetlands subtotal* | *48,793* | *78.3%* | *13,517* | *280* | *0* | *87.9%* | *27.7%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 1,059 | 1.7% | 463 | 21 | 0 | 3.0% | 43.7% |
| Freshwater marshes | 220 | 0.4% | 88 | 0 | 0 | 0.6% | 40.1% |
| Pasture/hay/grassland | 5,939 | 9.5% | 619 | 3 | 0 | 4.0% | 10.4% |
| Peatland | 2 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| Rocky outcrop | 719 | 1.2% | 259 | 4 | 0 | 1.7% | 36.1% |
| *Non-forested uplands and wetlands subtotal* | *7,938* | *12.7%* | *1,429* | *29* | *0* | *9.3%* | *18.0%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1,299 | 2.1% | 30 | 0 | 0 | 0.2% | 2.3% |
| *Inland aquatic habitats subtotal* | *1,299* | *2.1%* | *30* | *0* | *0* | *0.2%* | *2.3%* |
| **Other** | | | | | | | |
| Developed | 4,288 | 6.9% | 395 | 2 | 0 | 2.6% | 9.2% |
| *Other subtotal* | *4,288* | *6.9%* | *395* | *2* | *0* | *2.6%* | *9.2%* |
| **TOTAL** | **62,318** | **100.0%** | **15,370** | **310** | **0** | **100.0%** | **24.7%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.44. Ompompanoosuc CFA – Preliminary Priority Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 13,282 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | **Ruffed Grouse**[A, I]<br>Whip-poor-will[A, I, J]<br>**Chestnut-sided Warbler**[A, I]<br>Brown Thrasher[I]<br>**Ovenbird**[A]<br>**Eastern Red Bat**[I]<br>American Redstart[A, J]<br>Black-and-white Warbler[J]<br>Broad-winged hawk[J]<br>Eastern Wood-pewee[A, J]<br>Northern Flicker[A, J]<br>Red-shouldered Hawk[I, J]<br>Black-throated Blue Warbler[A]<br>Yellow-bellied Sapsucker[A, J]<br>Veery[A]<br>Rose-breasted Grosbeak[A]<br>Black Bear[I]<br>Bobcat[I]<br>Jefferson Salamander [I]<br>Four-toed Salamander[I]<br>Black-throated Green Warbler[A]<br>Canada Warbler[A,I]<br>Purple Finch[A]<br>Black-billed Cuckoo[A,I]<br>Northern Parul[aA] |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Chestnut-sided Warbler**[A, B, I] | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Little Brown Bat[E]<br>Tri-colored Bat[E]<br>Northern Long-eared Bat[E]<br>Eastern Small-footed Bat[E] | Caves used for hibernation. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/ nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, and Darling Guidelines, unpublished). | |
| **Blackburnian Warbler**[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Hodgman et al. 2000, Dunn et al. 1997, Morse 2004). | |
| Bald Eagle[C, G]<br>Osprey[G] | Breeding and migrating habitat includes large bodies of water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf et al. 2001). | |
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 126 acres** | | |
| Little Brown Bat[E]<br>Tri-colored Bat[E]<br>Northern Long-eared Bat[E]<br>Eastern Small-footed Bat[E] | Caves used for hibernation. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/ nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, and Darling Guidelines, unpublished). | Chestnut-sided Warbler[A, I]<br>Black Racer[I]<br>Ruffed Grouse[A, I]<br>American Woodcock[A,I]<br>**Warbling Vireo**<br>**Willow Flycatcher**<br>American Redstart[A, J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>Wood Duck[A, J]<br>Canada Goose[J]<br>Mallard[J]<br>Veery[A,I] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Swamps (Conifer)[5] – 109 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 feet within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | **Northern Waterthrush**<br>Red-shouldered Hawk[I,J]<br>Rose-breasted Grosbeak[A,J]<br>Purple Finch[A]<br>Veery[A,I,J]<br>White-eyed Vireo[J]<br>Willow Flycatcher[J]<br>Wood Duck[A,J]<br>Northern Parula[A] |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] – 463 acres** | | |
| Peregrine Falcon[C, G] | Nests on cliffs, ledges, and talus slopes near open habitats including rivers, lakes, and marshes, and lack of human disturbance (DeGraaf et al. 2001). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Freshwater Marshes[5] - 88 acres** | | |
| **American Black Duck[A, B, C, G]** | Breeding and migrating habitat includes herbaceous wetlands, fens, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Canada Goose[J]<br>Mallard[J]<br>**Marsh Wren**<br>Northern Harrier[A,I,J]<br>Great Blue Heron[I]<br>**American Bittern[A,I]**<br>Eastern Ribbon Snake[I]<br>Water Shrew[I]<br>Wood Duck[J] |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland[5] - 619 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[J]<br>Northern Harrier[A,I,J]<br>Chestnut-sided Warbler[A,I]<br>**Bobolink[A,I]**<br>**Grasshopper Sparrow[I]**<br>**Eastern Meadowlark[I]** |
| **Rocky Outcrop[5] – 259 acres** | | |
| Laurentian-Acadian calcareous rocky outcrop[H] | This outcrop system occurs on ridges or summits of circumneutral (pH 5.5 to 7.4) to calcareous (pH >7.4) bedrock. Sites are often exposed and dry; however, there may be local areas of more moist conditions. The vegetation is often a mosaic of woodlands and open glades. This system may also occur on rocks that are primarily acidic but with a local influence of calcium through weathering (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] – 30 acres** | | |
| **Brook Trout**[B, F] | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Riffle Snaketail[I]<br>Brook Snaketail[I]<br>Maine Snaketail[I]<br>Zebra Clubtail[I]<br>Water Shrew[I] |
| **Atlantic Salmon**[B, F, G] | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2005 Vermont Wildlife Action Plan (Species of Greatest Conservation Need)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Ompompanoosuc CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forests)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure for the diversity of species present, including wood thrush, American woodcock, chestnut-sided warbler, blackburnian warbler, Canada warbler, bald eagle, osprey, and cave dwelling bats.

***Rationale:***
We envision healthy forests within the Ompompanoosuc CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Vermont's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Ompompanoosuc CFA hardwood forests are diverse and productive for wildlife, and abundant, high-quality habitat is most certainly available within the CFA. However, to date our review of Ompompanoosuc's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Ompompanoosuc comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of Ompompanoosuc are more homogeneous than those of three centuries earlier, and include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management with the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Ompompanoosuc will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, bald eagles, and—if wetlands and riparian areas are present—Canada warbler (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Ompompanoosuc's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance to species like Canada warbler. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). Wood thrush also has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who dwell in the upper canopies of conifers, and are thought to be strongly associated with the hemlock forests within Ompompanoosuc. Blackburnian warblers have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and black-throated blue warbler.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. The Ompompanoosuc River CFA southwestern boundary is less than a mile from the abandoned Ely Copper Mine (see sub-objective 1.2b for further discussion). Over eight hundred bats have hibernated in this mine before white-nose syndrome, including little brown bats, northern long-eared bats, tricolored bats, eastern small-footed and big brown bats. A survey by Vermont Fish and Wildlife in 2013 showed a drastic decline in bats, with just under 200 present (Darling personal communication 2013). Little brown and northern long-eared bats were hit the hardest from white-nose syndrome. These species, as well as the tricolored and eastern small-footed bats, are undergoing review for listing under the ESA, and therefore are a PRRC. Little brown bat and tricolored bat are currently being assessed for candidate status, while northern long-eared and eastern small-footed bat have been petitioned for listing under the ESA. Upon emergence from the hibernacula, females will travel to their summer range to give birth to pups in maternity colonies, while male bats often remain within 5 miles of the hibernaculum throughout the summer (Darling, unpublished). Crevices behind peeling bark of large diameter trees or cavities in partially decayed trees are used for maternity colonies and summer day roosts (Caceres and Pybus 1997). CFA habitats may still play a significant role as roosting, feeding, and potential maternity sites.

Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Emergent white pines—tall, large-diameter trees that extend above the canopy—provide special habitats that, when near open bodies of water, are utilized by bald eagles and osprey. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure, species composition, and/or ecological function. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Identify forest stands where soils and species composition will support woodcock management.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Retain and recruit 3 to 6 large (16 inch DBH) live or dead trees such as silver maple, beech, green ash, yellow birch, and sugar maple per acre within a 5-mile radius of bat hibernacula as bat roosting sites.
- Create small canopy openings to improve solar exposure of existing or potential roost trees.
- Maintain contiguous late successional forest cover within 2 to 3 miles of rock cliffs and ledges to protect potential roosting sites of eastern small-footed bats.
- Implement identified active forest management opportunities using accepted silvicultural practices.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.

**Sub-objective 1.1b. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including bat species and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including foraging bats and American black duck, priority refuge resources of concern.

A forested landscape comprised of large diameter trees, and openings provide the most suitable habitat for bats (see sub-objective 1.1a). Foraging activity generally occurs in forest cover, though the specific habitat often depends on the species flight ability and echolocation frequency. Stream corridors, wetlands, vernal pools, and ponds provide high insect populations for feeding bats, as well as a water source (Caceres and Pybus 1997,

Zimmerman and Glanz 2000, Brooks and Ford 2005). Access to water is an important resource to prevent dehydration. Management in the CFA will focus on maintaining forested buffers along water bodies and shrub wetlands, and connectivity to forest habitats.

American black ducks also use shrub swamp communities, with a preference for shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation, and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests near foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf and Yamasaki 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Bat species and American black duck are not the only species that rely on shrub swamp habitats. American woodcock, a priority refuge resource of concern will benefit from shrub swamp management. American woodcock require moist, rich soils dominated by dense shrub cover for foraging habitat. Shrub swamps dominated by alder is ideal, although young aspen and birch are also suitable as feeding areas and daytime cover. Woodcock require varying habitat conditions that are within close proximity of each other. These include clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Chestnut-sided warbler will also use shrub swamps. This species is declining across the region due to habitat loss, and is a HIGH species for conservation in BCR 14. Other species include willow flycatcher, ruffed grouse, and eastern ribbon snake.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Conifer Swamps)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the Ompompanoosuc Conservation Focus Area (CFA), conifer swamps frequently have been altered and have potential for restoration. This habitat type is often found in small patches on mineral soils that are nutrient poor; there may be an organic layer, but generally deep peat soils are absent. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. The dynamic nature of the watertable drives complexes of forest upland and wetland species including red maple, balsam fir, red spruce, and ash species. Where soils tend more to alkaline conditions, white cedar is a common tree species, and the shrub layer is generally more diverse. Within the Connecticut

River watershed, agricultural practices and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition. Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in softwood swamps are not well understood. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within Ompompanoosuc will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Where needed, restoration of softwood swamp habitats will create high-quality habitat for neotropical migratory birds. Closed canopy softwood forests that include white cedar and other softwoods provide important mast, food, nesting, and cover. Softwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Lambert et al. 2005, Reitsma et al. 2008, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity in forests fragmented by suburban sprawl (Robbins et al. 1989). Conifer swamps in the Ompompanoosuc CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Conifer swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the Ompompanoosuc CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the VFWD, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

- Map vernal pools and seeps.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Cliff and Talus)**
Protect cliffs, ledges, and talus slopes to maintain the biological integrity, health and diversity of associated natural and rare ecological communities. Emphasis will be on sites occupied by nesting peregrine falcons and roosting bats.

***Rationale:***

Cliff and talus systems within this CFA occur below treeline at low to mid elevations. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places (Gawler 2008). The type of rock, microclimate, and soil availability from higher elevation sources directly and indirectly influence vegetation within these systems (Thompson and Sorenson 2000). Rock types may include limestone, dolomite, granite, schist, slate, or shale which breakdown differently in the environment providing varying levels of nutrients, moisture, ground stabilization, and soil availability. Sun exposure, aspect, elevation, and moisture provide different microclimate conditions affecting vegetation type and growth. These systems provide unique niches for rare and uncommon plants, and habitat for snakes, including the rare eastern timber rattlesnake, black rat snake, and eastern garter snake. Exposed cliffs provide nesting habitat for turkey vultures, ravens, porcupines, and peregrine falcons, a state species of greatest conservation need. Peregrine falcons are also a refuge purpose species. Vermont's breeding population has increased steadily since they were extirpated from the eastern US in the mid to late 1960s due to indiscriminate use of DDT following World War II. Peregrines are nesting in Ompompanoosuc River CFA, and monitoring and management of Vermont's peregrine population is being coordinated by Audubon Vermont.

Bats will use caves or mines within the cliff and talus systems for "hibernacula," where they hibernate, and rock crevices for summer roosting sites. This region hosts bat hibernacula—the unused Ely Copper mine in Vershire. The Ely Copper mine has been surveyed each winter since 1992 by VFWD. More than 800 bats have hibernated in this mine before white-nose syndrome, including little brown, northern long-eared, tricolored, eastern small-footed, and big brown bats. A survey by VFWD in 2013 showed a drastic decline in bats, with just under 200 present (Darling personal communication 2013). Little brown and northern long-eared bats were hit the hardest from white-nose syndrome. Although this hibernaculum is less than a mile from the CFA boundary, the habitats within the CFA are still significant for roosting, feeding and for potential maternity sites (see sub-objective 1.1a for further discussion).

Conservation of cliff and talus systems in the Ompompanoosuc River CFA will begin with a comprehensive, multi-scale wildlife and habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of cliff and talus systems at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate and manage human (e.g., recreational) influences on cliff and talus ecosystem, and conduct outreach and education as necessary.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

- Identify historical, active, and potential peregrine falcon nesting sites.
- Coordinate with conservation organizations to conduct spring surveys of identified sites to determine occupancy.
- Work with partners to annually monitor active sites to determine occupancy status and reproductive outcome.
- Survey for and protect bat roosting sites.

**Sub-objective 1.2b. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the Ompompanoosuc River watershed. Our coarse-scale habitat analysis of this CFA identifies the majority of the wetlands occurring along the North and Middle Brooks. This particular wetland complex, adjacent to open water habitat, would provide important breeding and foraging habitat for American black duck, and other waterfowl species. Located within the Connecticut River watershed, an important migration corridor, this area may also be important as staging areas for migrating waterfowl. An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for waterfowl species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Minimize impacts to wetlands from adjacent habitat management and recreational activities.
- Encourage local landowners to use Vermont Best Management Practices within active agricultural fields that are located along the perimeter of marsh habitats.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.2c. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
More than four percent of the Ompompanoosuc River CFA is pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay,

and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses, providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such

as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Ompompanoosuc CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.

- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and unimpeded aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and Atlantic salmon.

***Rationale:***
The Ompompanoosuc River, and a few brooks and small ponds occur in the Ompompanoosuc CFA. The Ompompanoosuc River occurs in the western portion of the CFA where it flows southeast through Eagle Hollow and West Fairlee to the Connecticut River main stem. A few small streams in the CFA flow into the Ompompanoosuc River, while Blood Brook and Middle Brook flow into Lake Fairlee, located outside of the CFA's southern boundary. These water resources provide high quality cold water habitat for brook trout and Atlantic salmon. These species are sensitive to extreme temperature fluctuations, and require water temperatures between 40-70 degrees Fahrenheit for spawning, growth, and survival. Brook trout and salmon are a high priority for conservation by the State and the Service's Northeast Region. Other species that occur in the Ompompanoosuc River CFA include creek chub, white sucker, slimy sculpin, and blacknose dace.

The Ely Copper Mine is less than a mile from the Ompompanoosuc CFA in Vershire, and is listed by the U.S. Environmental Protection Agency as a superfund site. Elevated metal and sulfide concentrations have affected nearby and downstream water resources, and the EPA has implemented a cleanup plan for portions of this site (U.S. Environmental Protection Agency 2013). Contamination of CFA habitats has not occurred, though the lower reaches of the Ompompanoosuc River have shown negative consequences. Providing healthy ecosystems within the CFA will assist with mitigating impacts from this superfund site.

Management of water resources in the Ompompanoosuc River CFA will focus on rivers and streams that provide continuous aquatic species passage to spawning and wintering habitat, are structurally diverse, with boulders and downed woody debris providing riffles and pools, and shade trees along riparian edges. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of open water habitat at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*
- Work with partners to implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with partners to conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity and health.

- Work with partners to conduct stream assessments to identify man-made physical barriers (e.g., impassable road crossings, culverts and dams) to the movement of fish and other aquatic organisms.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not Applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not Applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Ompompanoosuc Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Design or adapt curricula for the Ompompanoosuc Division that focuses on watersheds, on local habitats, and on local natural and cultural resources.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Ompompanoosuc Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Ompompanoosuc Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Ompompanoosuc Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the Ompompanoosuc Division would be suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Ompompanoosuc Division's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Ompompanoosuc Division.
- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, print and social media, signs, and exhibits) when creating programming for natural and cultural resource interpretation.
- Make Certified Interpretive Guide (NAI) training available once every other year for refuge personnel, Friends Group members and the general public, with priority given to refuge affiliates.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Ompompanoosuc Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.

- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Ompompanoosuc Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the Sunderland and Nulhegan Basin Division Offices and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Ompompanoosuc Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below.

***Rationale:***
The Ompompanoosuc CFA is a popular area to hunt white-tailed deer, Eastern wild turkey, black bear, and small game. Hunting would be allowed on a newly created division consistent with the final compatibility determination. Hunting, if found to be a compatible use, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e., 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with VFWD to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with VFWD to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Ompompanoosuc Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with VFWD to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.
- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the Ompompanoosuc Division after completing all administrative procedures to officially open refuge lands to fishing, based on VFWD regulations, and any division-specific conditions.

***Rationale:***
There are several streams in the proposed CFA including the Ompompanoosuc River, Middle Brook, Blood Brook, and Bear Notch Brook. The Ompompanoosuc River supports a cold water fishery with brook trout, brown trout, and rainbow trout. A variety of game fish are found in the other streams of the CFA, with quality fishing opportunities for brook trout in Middle Brook and Bear Notch Brook. Fishing is a popular activity throughout this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The Ompompanoosuc Division would be open daily to all visitors, including anglers, from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters.

*Within 5 years of acquiring land with fishable waters:*

- Work with the VFWD to inventory and assess fish populations on the division.
- Work with the VFWD to evaluate potential fishing enhancements, especially to Middle Brook and Bear Notch Brook.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine whether the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available at the refuge website, refuge offices, division kiosks, through friends groups, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. Local organizations such as Vermont Audubon chapters and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring sufficient land:*

- Develop a public access strategy and required planning (e.g., NEPA compliance and compatibility determinations) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring sufficient land:*

- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups such as a local chapter of Vermont Audubon and other environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring sufficient land:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Ompompanoosuc Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Ompompanoosuc Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that are part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Develop compatible opportunities on the Ompompanoosuc Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking; pets must be on a leash no longer than 6 feet long and must be under the control of their owners/handlers to avoid posing a threat to other visitors, staff, or wildlife.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Work with users to delineate winter cross-country trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of acquiring sufficient land:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Ottauquechee River Conservation Focus Area (Proposed)

## Bridgewater, Vermont

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 5,985 | 100 % |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *5,985* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 0 | 0 % |
| Total Acres in CFA[2, 4] | 5,985 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS. [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers. .

## What specific criteria and/or considerations drove the selection of this CFA?

The proposed Ottauquechee River CFA is located near a large network of conserved lands, including Les Newell Wildlife Management Area and extensive lands protected by the Vermont Land Trust lands. Additional land protection by the Service in this area will help better connect these conserved lands. The Appalachian Trail Corridor also abuts the proposed CFA, providing outstanding recreational opportunities. The proposed CFA encompasses contiguous forest, which is expected to be resilient to climate change impacts.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 87.5%

See map A.63 and table A.45 for more detailed habitat information for the CFA.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.46 below, there are nine Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to species that require large contiguous forest tracts including American black bear, bobcat, and forest interior dwelling bird species. These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receive higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Ottauquechee River CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

Over 89% of the CFA is contiguous forest, interspersed with riparian, cliff and talus, and rocky outcrop communities. These habitats contribute to the larger core of undeveloped land within the landscape. The CFA provides breeding for a diversity of landbirds including species of conservation concern and forest interior dwelling species. This CFA is in the core range for many of these species including black-throated blue warbler, blackburnian warbler, chestnut-sided warbler, black-throated green warbler, and wood thrush. Wood thrush and chestnut-sided warbler are PRRC species that rely on different forest successional stages within the CFA. Peregrine falcon is another PRRC species, as well as a State Species of Greatest Conservation Need (SGCN). The cliff and talus systems in the CFA are used by nesting peregrine falcons, where the elevations can rise above 2,000 feet.

2. **Diadromous fish and other aquatic species**
   The North Branch of the Ottauquechee River flows along the west boundary of Ottauquechee CFA. This branch flows southeastwardly through the towns of Killington and Bridgewater meeting up with the Ottauquechee main stem in Bridgewater Corners. The North Branch provides high quality cold water habitat for PRRC species including brook trout and Atlantic salmon. These species are high conservation concern for the State and the Service's Northeast Region. Other species that occur in the Ottauquechee River CFA include creek chub, white sucker, slimy sculpin, and blacknose dace.

3. **Other**
   The Ottauquechee River CFA western boundary is within a mile of the abandoned Bridgewater Mines, which were once occupied by more than 100 hibernating little brown, tri-colored, big brown and northern long-eared bats. These mines are no longer being used by bats due to decimation by white-nose syndrome. Northern long-eared bats were recently listed as federally threatened. Little brown bats, as well as the tricolored and eastern small-footed bats, are undergoing review for listing under the ESA, and therefore are a PRRC. Little brown bat and tricolored bat are currently being assessed for candidate status, and eastern small-footed bat have been petitioned for listing under the ESA. The habitats within the CFA may still provide current or future roosting, feeding and potential maternity sites.

   The rocky outcrops and forested habitats within the CFA provide denning sites for American black bear and bobcat, as well as a contiguous landscape for these wide ranging mammals to breed and disperse.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down HMP. Once inventory has been completed, then management will focus on maintaining the following conditions:

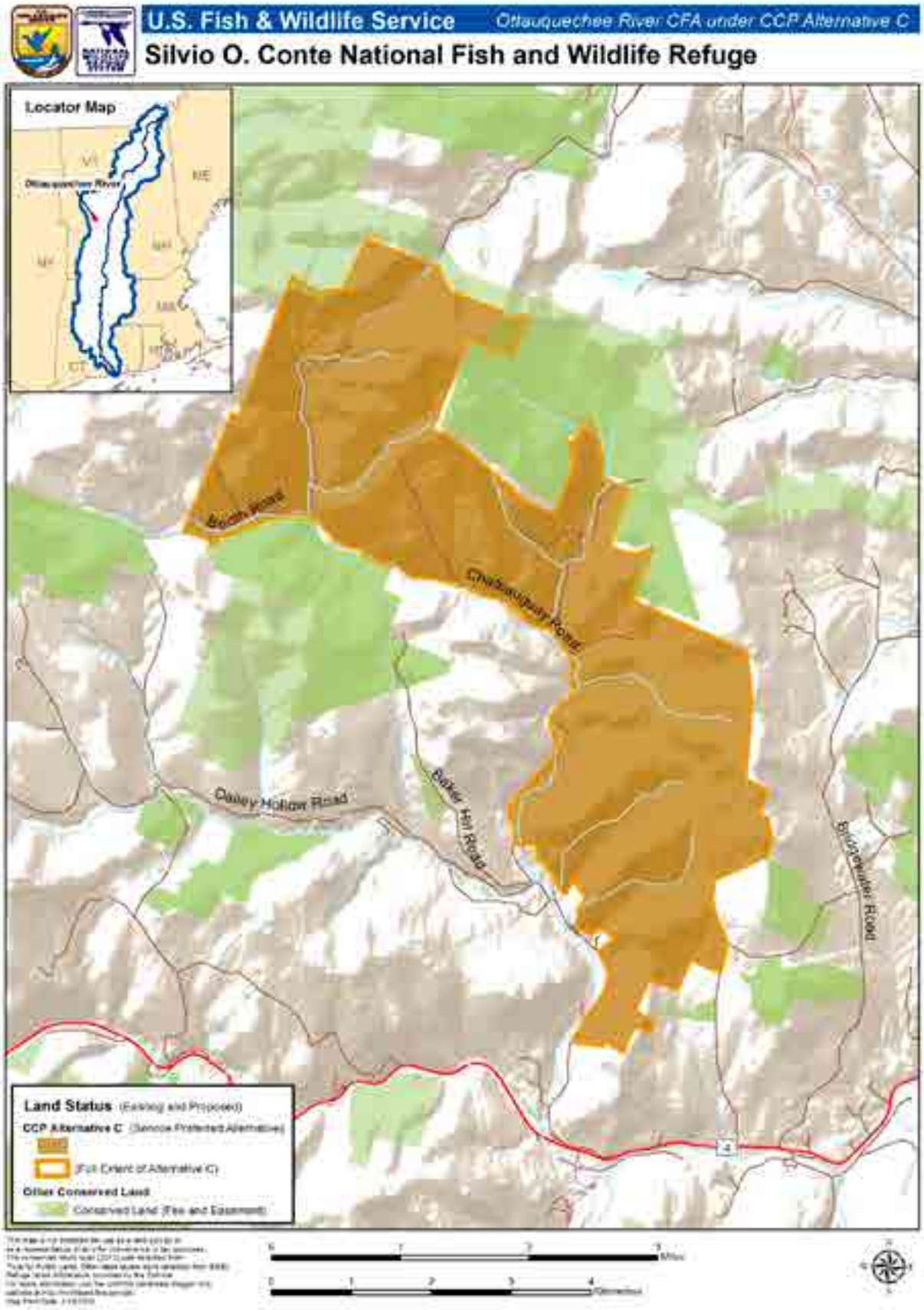
- Forest management activities will provide diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and appropriate for site conditions and location.

- In open water (stream, rivers) habitats, we will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and uninterrupted aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

The National Wildlife Refuge System Improvement Act of 1997 identified hunting, fishing, wildlife observation, photography, interpretation, and environmental education as priority, wildlife-dependent uses. As such, these uses would receive priority on refuge lands.

*Map A.62. Ottauquechee River CFA – Location.*



*Map A.63. Ottauquechee River CPA/CFA – Habitat Types.*

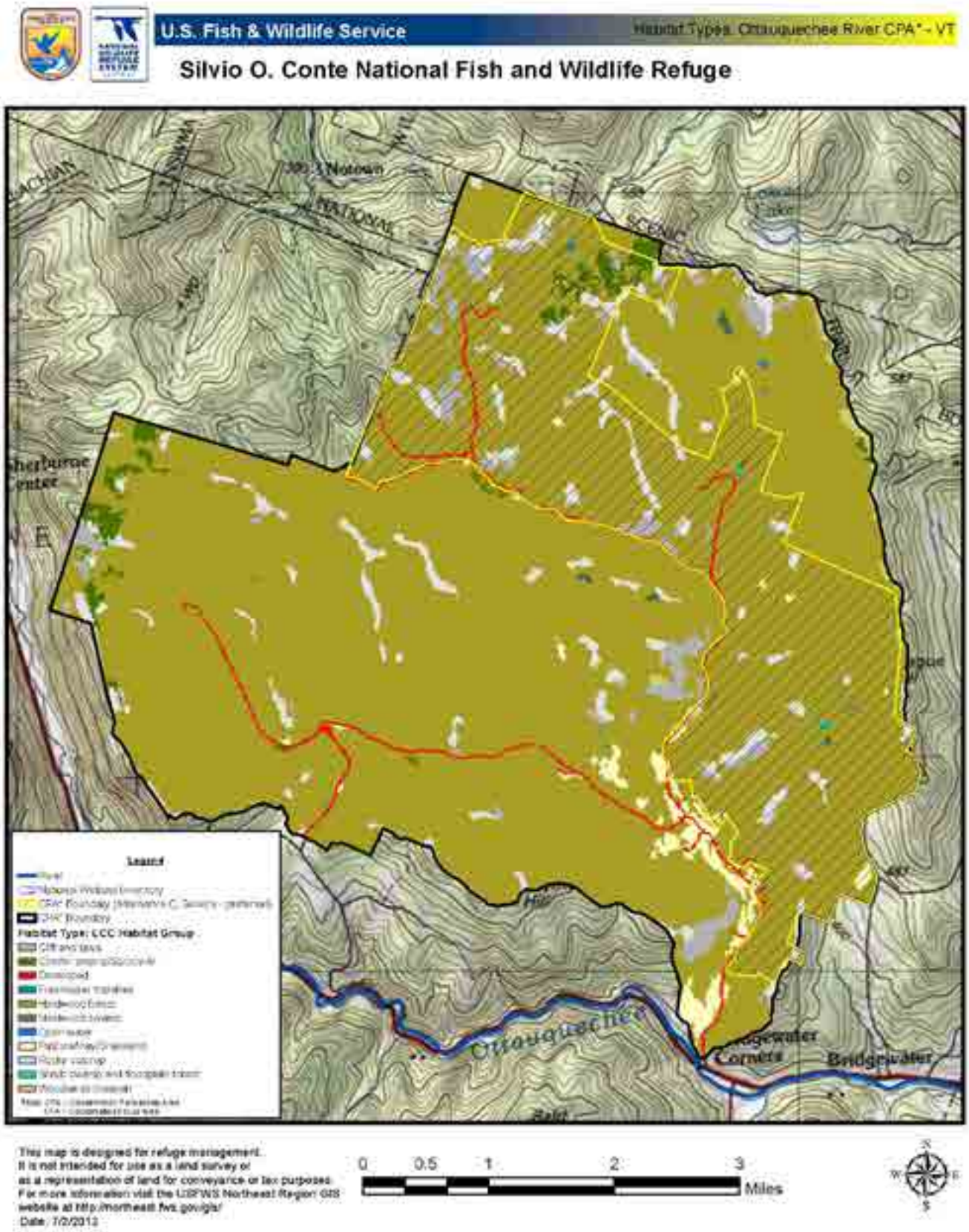


**Table A.45. Ottauquechee River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 256 | 1.4% | 93 | 0 | 0 | 1.6% | 36.3% |
| Hardwood forest | 15,854 | 88.6% | 5,234 | 70 | 0 | 87.5% | 33.0% |
| Hardwood swamp | 3 | 0.0% | 3 | 0 | 0 | 0.0% | 100.0% |
| Shrub swamp and floodplain forest | 4 | 0.0% | 4 | 0 | 0 | 0.1% | 100.0% |
| Woodlands (natural) | 65 | 0.4% | 3 | 0 | 0 | 0.1% | 5.1% |
| *Forested uplands and wetlands subtotal* | *16,181* | *90.4%* | *5,337* | *70* | *0* | *89.2%* | *33.0%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 438 | 2.4% | 200 | 3 | 0 | 3.3% | 45.7% |
| Freshwater marshes | 2 | 0.0% | 2 | 0 | 0 | 0.0% | 100.0% |
| Pasture/hay/grassland | 295 | 1.6% | 38 | 1 | 0 | 0.6% | 13.0% |
| Rocky outcrop | 757 | 4.2% | 338 | 13 | 0 | 5.6% | 44.6% |
| *Non-forested uplands and wetlands subtotal* | *1,492* | *8.3%* | *578* | *17* | *0* | *9.7%* | *38.7%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 1 | 0.0% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Inland aquatic habitats subtotal* | *1* | *0.0%* | *0* | *0* | *0* | *0.0%* | *0.0%* |
| **Other** | | | | | | | |
| Developed | 228 | 1.3% | 66 | 0 | 0 | 0.7% | 28.8% |
| *Other subtotal* | *228* | *1.3%* | *66* | *0* | *0* | *0.7%* | *28.8%* |
| **TOTAL** | **17,903** | **100.0%** | **9,803** | **152** | **0** | **100.0%** | **54.8%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.46. Ottauquechee River CFA – Preliminary Priority Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 5,321 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Baltimore Oriole[J]<br>Black-and-white Warbler[J]<br>Black-billed Cuckoo[A,I,J]<br>Broad-winged hawk[J]<br>Rose-breasted Grosbeak[A]<br>Northern Flicker[A, J]<br>Scarlet Tanager[J]<br>Ruffed Grouse[A, I]<br>Whip-poor-will[A, I, J]<br>**Louisiana Waterthrush**<br>Brown Thrasher[I]<br>Blackburnian Warbler[A]<br>**Ovenbird**[A]<br>**Eastern Red Bat**[I]<br>American Redstart[A, J]<br>Eastern Wood-pewee[A, J]<br>Red-shouldered Hawk[I, J]<br>Black-throated Green Warbler[A]<br>Black-throated Blue Warbler[A,I]<br>Yellow-bellied Sapsucker[A,J]<br>Bobcat[I]<br>Long-tailed Weasel[I]<br>Woodland Vole[I]<br>Black Bear[I]<br>Veery[A,I] |
| **Chestnut-sided Warbler**[A, B] | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Little Brown Bat[B,E]<br>Tri-colored Bat[E]<br>Northern Long-eared Bat[E]<br>Eastern Small-footed Bat[E] | Caves used for hibernation. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/ nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, Darling Guidelines, unpublished). | |
| **Conifer Swamp[5] - 6 acres** | | |
| Laurentian-Acadian conifer-hardwood acidic swamp[H]<br><br>Laurentian-Acadian alkaline conifer-hardwood swamp[H] | The *conifer-hardwood acidic swamps* occur on mineral soils that are nutrient-poor; there may be an organic top soil horizon, but the substrate is generally not deep peat. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. Red maple, ash, red spruce (rarely Black spruce), and balsam fir are the most typical trees. The herbaceous and shrub layers tend to be fairly species-poor, and include catberry and ferns of the genus Osmunda. Northern white cedar is a diagnostic canopy species within the *alkaline conifer-hardwood swamp*. It may dominate the canopy or mixed with other conifers or deciduous trees, most commonly Red maple or Black ash. Red osier dogwood is a common shrub. The herb layer tends to be diverse, and small open areas fed by mineral rich waters may occur within the wetland (Gawler 2008). | Uncommon plant communities within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Swamp[5] – 3 acres** | | |
| North-Central Appalachian acidic swamp[H] | *North-Central Appalachian acidic swamps* are found in basins or on gently sloping seepage lowlands. Eastern hemlock is usually present and may be dominant. It is often mixed with deciduous wetland trees such as red maple or black tupelo. Species of the genus Sphagnum are an important component of the moss layer (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Shrub Swamp and Floodplain Forest [5] – 4 acres** | | |
| Laurentian-Acadian wet meadow-shrub swamp[H] | *Wet meadow-shrub-swamps* are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and grass dominance; typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Trees are generally absent and, if present, are scattered (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Woodlands (Natural) [5] – 3 acres** | | |
| Central Appalachian alkaline glade and woodland[H] | The *alkaline glade and woodland* system consists of woodlands and open glades on thin soil over limestone, dolostone or similar calcareous rock. In some cases, the woodlands grade into closed-canopy forests. Eastern red cedar is a common tree, and chinquapin oak is indicative of the limestone substrate. In the northern periphery of the range, northern white cedar may replace eastern red cedar. Prairie grasses are the dominant herbs; forb richness is often high. Fire is an important natural disturbance vector (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Rocky Outcrop[5] – 338 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | The *Northern Appalachian-Acadian rocky heath outcrop* system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Low-bush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Freshwater Marshes[5] - 2 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Cliff and Talus[5] – 200 acres** | | |
| Peregrine Falcon[C, G] | Nests on cliffs, ledges, and talus slopes near open habitats including rivers, lakes, and marshes, and lack of human disturbance (DeGraaf et al. 2001). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Pasture/hay/grassland[5] – 38 acres** | | |
| Where appropriate and supported by the local community, restore to forest habitat types | See species composition and structure above. | See species associated with forested habitat types above. |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Open Water[5] – 1 acre** | | |
| **Brook Trout**[F] | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Blacknose Shiner[I]<br>Riffle Snaketail[H]<br>Brook Snaketail[H]<br>Zebra Clubtail[H] |
| **Atlantic Salmon**[F, G] | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2005 Vermont Wildlife Action Plan (Species of Greatest Conservation Need)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the Ottauquechee River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, chestnut-sided warbler, and cave dwelling bats.

***Rationale:***
We envision healthy forests within the Ottauquechee CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Vermont's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

Hardwood forests within Ottauquechee CFA are diverse and productive for wildlife, and abundant, high-quality habitat is most certainly available. To date our review of Ottauquechee habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within Ottauquechee comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of Ottauquechee are more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000a, 2000b, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management with the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within Ottauquechee will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like chestnut warbler, a North Atlantic LCC (NALCC) representative species are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal structure will provide foraging opportunities for bats, and support other species of conservation concern like ruffed grouse, black-throated blue warbler, American redstart, and black bear.

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. Ottauquechee River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region.

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Closed canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated blue warbler, black-throated green warbler, and— when along rocky bottomed streams— Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, which has implications for wildlife habitats and nutrient cycling. The Ottauquechee River CFA western boundary is within a mile of the Bridgewater Mines, which were formerly used by more than one hundred hibernating little brown, tricolored, big brown, and northern long-eared bats (see sub-objective 1.2b for further discussion). These mines are no longer being used by bats due to their decimation by white-nose syndrome. Little brown, northern long-eared, tricolored and eastern small-footed bats are undergoing review for listing under the ESA. Little brown bat and tricolored bat are currently being assessed for candidate status, while northern long-eared and eastern small-footed bat have been petitioned for listing under the ESA. Upon emergence from the hibernacula, females will travel to their summer range to give birth to pups in maternity colonies, while male bats often remain within 5 miles of the hibernaculum throughout the summer (Darling, unpublished). Crevices behind peeling bark of large diameter trees or cavities in partially decayed trees are used for maternity colonies and summer day roosts (Caceres and Pybus 1997). Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Identify sites appropriate for early successional management.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices.

- Retain and recruit 3 to 6 large (greater than 16 dbh) live or dead trees such as silver maple, beech, yellow birch, green ash and sugar maple per acre within a 5-mile radius of bat hibernacula as bat roosting sites.
- Create small canopy openings to improve solar exposure of existing or potential roost trees.
- Maintain contiguous late successional forest cover within 2 to 3 miles of rock cliffs and ledges to protect potential roosting sites of eastern small-footed bats.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.
- Survey for and protect active maternity colonies and summer roost sites.

**Sub-objective 1.1b. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management

that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Ottauquechee CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Cliff and Talus)**
Protect cliffs, ledges, and talus slopes to maintain the biological integrity, health and diversity of associated natural and rare ecological communities. Emphasis will be on sites occupied by nesting peregrine falcons and roosting bats.

***Rationale:***
Cliff and talus systems within this CFA occur below treeline at low to mid elevations. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places (Gawler 2008). The type of rock, microclimate, and soil availability from higher elevation sources directly and indirectly influence vegetation within these systems (Thompson and Sorenson 2000). Rock types may include limestone, dolomite, granite, schist, slate, or shale which breakdown differently in the environment providing varying levels of

nutrients, moisture, ground stabilization, and soil availability. Sun exposure, aspect, elevation, and moisture provide different microclimate conditions impacting vegetation type and growth. These systems provide unique niches for rare and uncommon plants, and habitat for snakes, including the rare eastern timber rattlesnake, black rat snake, and eastern garter snake. Exposed cliffs provide nesting habitat for turkey vultures, ravens, porcupines, and peregrine falcons, a state species of greatest conservation need. Peregrine falcons are also a refuge purpose species. Vermont's breeding population has increased steadily since they were extirpated from the eastern US in the mid to late 1960s due to indiscriminate use of DDT following World War II. Peregrines are nesting in Ottauquechee River CFA, and monitoring and management of Vermont's peregrine population is being coordinated by Audubon Vermont.

Bats will use caves or mines within the cliff and talus systems for "hibernacula" where they hibernate, and rock crevices for summer roosting sites. This region hosted two bat hibernacula: two unused mines in Bridgewater. The Bridgewater mines were surveyed in the winter by VFWD between 2009 and 2013. More than one hundred bats were hibernating in each mine, including little brown bats, northern long-eared bats, tri-colored bats, and big brown bats. These mines are no longer being used by bats due to decimation by white-nose syndrome. Although this hibernaculum is about a mile from the CFA boundary, and no longer used by bats at this time, the habitats within the CFA are still significant for roosting, feeding and for potential maternity sites (see sub-objective 1.1a for further discussion).

Conservation of cliff and talus systems in the Ottauquechee River CFA will begin with a comprehensive, multi-scale wildlife and habitat inventory. Wildlife species survival and breeding success is dependent on not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of cliff and talus systems at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate and manage human (e.g., recreational) influences, and conduct outreach and education as necessary.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Survey for and protect bat roosting sites.
- Identify historical, active, and potential peregrine falcon nesting sites.
- Coordinate with conservation organizations to conduct spring surveys of identified peregrine falcon nest sites to determine occupancy.
- Work with partners to annually monitor active sites to determine occupancy status and reproductive outcome.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) for shrub-dependent conservation concern species such as chestnut-sided warbler.

***Rationale:***
Less than one percent of the Ottauquechee River CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat

patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Current pasture, hay, and grassland acres can provide quality habitat for these species, if managed appropriately. In order to make an informed management decision, it will be necessary to conduct a comprehensive, multi-scale wildlife and habitat inventory. Baseline information on the condition of these habitats will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- As new pasture, hay, and/or grassland habitat is acquired, evaluate its ecological importance to determine if it should be maintained, managed as shrubland or restored to native forest through tree plantings or natural succession.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

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filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter coønservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

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The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and Atlantic salmon.

***Rationale:***
The North Branch of the Ottauquechee River flows along the west boundary of Ottauquechee CFA. This branch flows southeastwardly through the towns of Killington and Bridgewater meeting up with the Ottauquechee main stem in Bridgewater Corners. The North Branch provides high quality cold water habitat for brook trout and Atlantic salmon. Brook trout and Atlantic salmon are sensitive to extreme temperature fluctuations, and require water temperatures between 40 to 70 degrees Fahrenheit for spawning, growth, and survival. Brook trout and salmon are a high priority for conservation by the State and the Service's Northeast Region. Other species that occur in the Ottauquechee River CFA include creek chub, white sucker, slimy sculpin, and blacknose dace.

Management of water resources in the Ottauquechee River CFA will focus on providing rivers and streams that provide unimpeded aquatic species passage to spawning and wintering habitat and in-stream habitat that is cold and structurally diverse. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of open water habitat will further inform more detailed habitat prescriptions within a required step-down HMP.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.

- Work with partners to conduct stream assessments to identify man-made physical barriers (e.g., impassable road crossings, culverts, and dams) to the movement of fish and other aquatic organisms.

*Within 10 years of land acquisition and CCP approval:*

- Work with partners to implement a remediation plan for identified obstacles to aquatic species passage.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Ottauquechee River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Ottauquechee River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Ottauquechee River Division as an outdoor classroom.

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Ottauquechee River Division as an outdoor classroom.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of environmental education programs.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Ottauquechee River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. At the Nulhegan Basin Division, interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail planned for the site, the Ottauquechee River Division is well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the Ottauquechee River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Ottauquechee River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, print and social media, signs, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the Ottauquechee River Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Ottauquechee River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Ottauquechee River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below.

***Rationale:***
The Ottauquechee CFA is a popular area to hunt white-tailed deer, Eastern wild turkey, and small game. Hunting will be allowed on a newly created division, consistent with the final compatibility determination. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners and determination that hunting is a compatible use at the division.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e., 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Vermont Fish and Wildlife Department to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Vermont Fish and Wildlife Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website, at Ottauquechee River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Vermont Fish and Wildlife Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the Ottauquechee River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Vermont Fish and Wildlife Department regulations, and any Division-specific conditions.

***Rationale:***
The North Branch Ottauquechee River and Cold Brook exist within the proposed CFA. The North Branch Ottauquechee River provides quality fishing opportunities for wild brook trout and wild rainbow trout, with large brook trout reported by anglers. Fishing is a popular activity in this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The Ottauquechee River Division would be open daily to all visitors, including anglers, from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters.

*Within 5 years of acquiring land with fishable waters:*

- Work with the Vermont Fish and Wildlife Department to inventory and assess fish populations on the division.
- Work with the Vermont Fish and Wildlife Department to evaluate potential fishing enhancements along the North Branch Ottauquechee River.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. Local organizations such as Vermont Audubon chapters and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.
- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring sufficient land:*

- Develop a public access strategy and required planning (i.e., NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring sufficient land:*

- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups such as a local chapter of Vermont Audubon and other environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring sufficient land:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Ottauquechee River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the Ottauquechee River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that are part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Develop compatible opportunities on the Ottauquechee River Division that connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of acquiring sufficient land:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# West River Conservation Focus Area (Proposed)

## Londonderry, Windham, Jamaica, Townshend, Newfane, and Wardsboro, Vermont

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 22,020 | 84.8% |
| ■ Existing Refuge Ownership in CFA[1] | *0* | |
| ■ Additional Acres in CFA proposed for Refuge Acquisition[2] | *22,020* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 3,945 | 15.2% |
| Total Acres in CFA[2, 4] | 25,965 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The West River, and its major tributaries, was proposed as an SFA in the 1995 Conte EIS. The CFA is part of a larger high priority area for the State of Vermont because it is a contiguous block of northern hardwood forest and its importance to interior forest birds. The proposed CFA is expected to be resilient to climate change. The proposed West River CFA is located near a large network of conserved lands, including the Green Mountain National Forest, Jamaica State Park, and Townshend State Forest. Additional land protection by the Service in this area will help better connect these conserved lands.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 89.8%
- Shrub Swamps and Floodplain Forest – 0.2%
- Freshwater Marsh – 0.6%

See map A.65 and table A.47 for more detailed habitat information for the CFA.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.48 below, there are 12 Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species, including one federal listed species that rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to numerous state-listed species including mussels and plants, as well as potential habitat for the federal listed dwarf wedge mussel based on historic records. These species and others are discussed further below.

1. **Federal Threatened and Endangered Species**
   The northeastern bulrush, a wetland plant, occurs in isolated small wetlands in the CFA. This species is federally listed, and has adapted to seasonal water fluctuations. Habitat alterations that change the hydrology of a wetland to be consistently wet or dry may have negative consequences for this species. Biologists are currently monitoring known populations, but more information is needed on the habitat

requirements, reproductive strategy, and genetic variability (USFWS 2006). Research, and preventing habitat destruction and deterioration of wetland sites where this plant is found are crucial steps to maintaining these northeastern bulrush populations.

The 1993 Recovery Plan for the species called for protection measures such as land acquisition and conservation easements (USFWS 1993). The 5-year review echoed these recommendations, stating that the highest priority actions are to resurveying populations that have not recently been surveyed, securing protection on public and private lands, conducting periodic surveys of populations to determine trends and threats, and implementing management tools to reduce threats and monitor effectiveness of these actions (USFWS 2008).

The aquatic habitats in the CFA support two candidate species, including American eel and brook floater. American eel enter the Connecticut River as juveniles, and migrate upstream to inhabit streams, lakes, and ponds of the West River CFA. Eels feed in these aquatic habitats until they reach sexual maturity and begin the long migration to their spawning grounds in the Sargasso Sea (ASMFC 2000). Brook floater require rivers and streams with high water quality, and are one among many species of freshwater mussels in the CFA.

2. **Migratory Birds**
The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The West River CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

The West River CFA is part of a larger block of unfragmented forest that includes almost 4,000 acres of conserved land. It is characterized by a high quality riverine ecosystem, surrounded by intact forested uplands and productive tributary streams. These habitats provide breeding habitat for a diversity of landbirds including species of conservation concern and forest interior dwelling species. This CFA is in the core range for many of these species including PRRC such as wood thrush, blackburnian warbler, Canada warbler, chestnut-sided warbler, and American woodcock.

3. **Waterfowl**
Potential breeding and foraging habitat for American black duck, a PRRC species, as well as wood duck, Canada geese, and other waterfowl species within wetlands adjacent to the Townshend Reservoir, West River tributaries and open water habitats.

4. **Diadromous fish and other aquatic species**
The West River flows through the northern portion of the CFA, and along the eastern boundary as it enters and exits the Townshend Reservoir. The West River has been rated as having the highest abundance of high quality open water habitat as measured by a Vermont Index of Biotic Integrity, a measure of fish community health. It has a wide range of representative reaches extending from its headwaters to its mouth supporting diverse assemblages of fish species. The West River is also considered representative for assemblages of mussels and invertebrates in several locations, including Cobb Brook, which flows through the northern portion of the CFA.

The main stem and tributaries provide high quality cold water habitat for PRRC species, including brook trout and Atlantic salmon. The lower West River provides habitat for warm water species as well as diadromous fish such as American shad and American eel, which are refuge resources of concern. American eel, is petitioned for Federal listing, and spends the majority of its young life in the freshwater systems of the CFA. The West River CFA also provides important aquatic habitat for freshwater mussels, including brook floater, another species petitioned for Federal listing. Sea lamprey, another species of conservation concern, also occurs in this CFA providing important ecological benefits to aquatic systems. Other species that occur in the West River CFA include yellow perch, creek chub, white sucker, pumpkinseed, carp, slimy sculpin and blacknose dace. These species are hosts for the earliest life stages of resident mussels.

The Townshend Reservoir is located in the northern portion of the CFA. This man-made lake is associated with the Townshend Dam, which was built on the West River in 1961 by the U.S. Army Corps of Engineers to prevent flooding along the Connecticut River. This lake is managed by Vermont Fish and Wildlife Department and the Army Corps of Engineers, and supports rainbow, brown and brook trout, yellow perch, largemouth bass and bullhead.

5. **Wetlands**
   The West River CFA contains 118 acres of hardwood swamp, 34 acres of conifer swamp, 54 acres shrub-swamp and floodplain forest, and 163 acres of freshwater marsh. Many of these wetlands are associated with slow moving streams or small ponds. The largest wetland patch, 45 acres of hardwood swamp, occurs near the Townsend Reservoir. Some of the freshwater marshes contain the Federal listed northeastern bulrush.

6. **Other**
   In addition to the federally endangered northeastern bulrush mentioned above, there is potential habitat for cobblestone tiger beetle, a species that has been petitioned for federal listing, within the West River CFA. This tiger beetle prefers sparsely vegetated sandy cobble beaches (Pyzikiewicz 2005). The West River provides these habitat conditions, and the cobblestone tiger beetle has been found in the watershed. This tiger beetle is a PRRC species, and listed as state-endangered. Other species of concern that occur in the West River watershed (not necessarily in the CFA) include the State-threatened brook floater mussel and eastern pearlshell, eleven State rare plant species, as well as historic records of the federally listed dwarf wedgemussel. The brook floater is petitioned for Federal listing, and therefore, is also a PRRC species.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (i.e., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan (HMP). Once inventory has been completed, then management will focus on maintaining the following conditions:

- Forest management activities will provide a diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

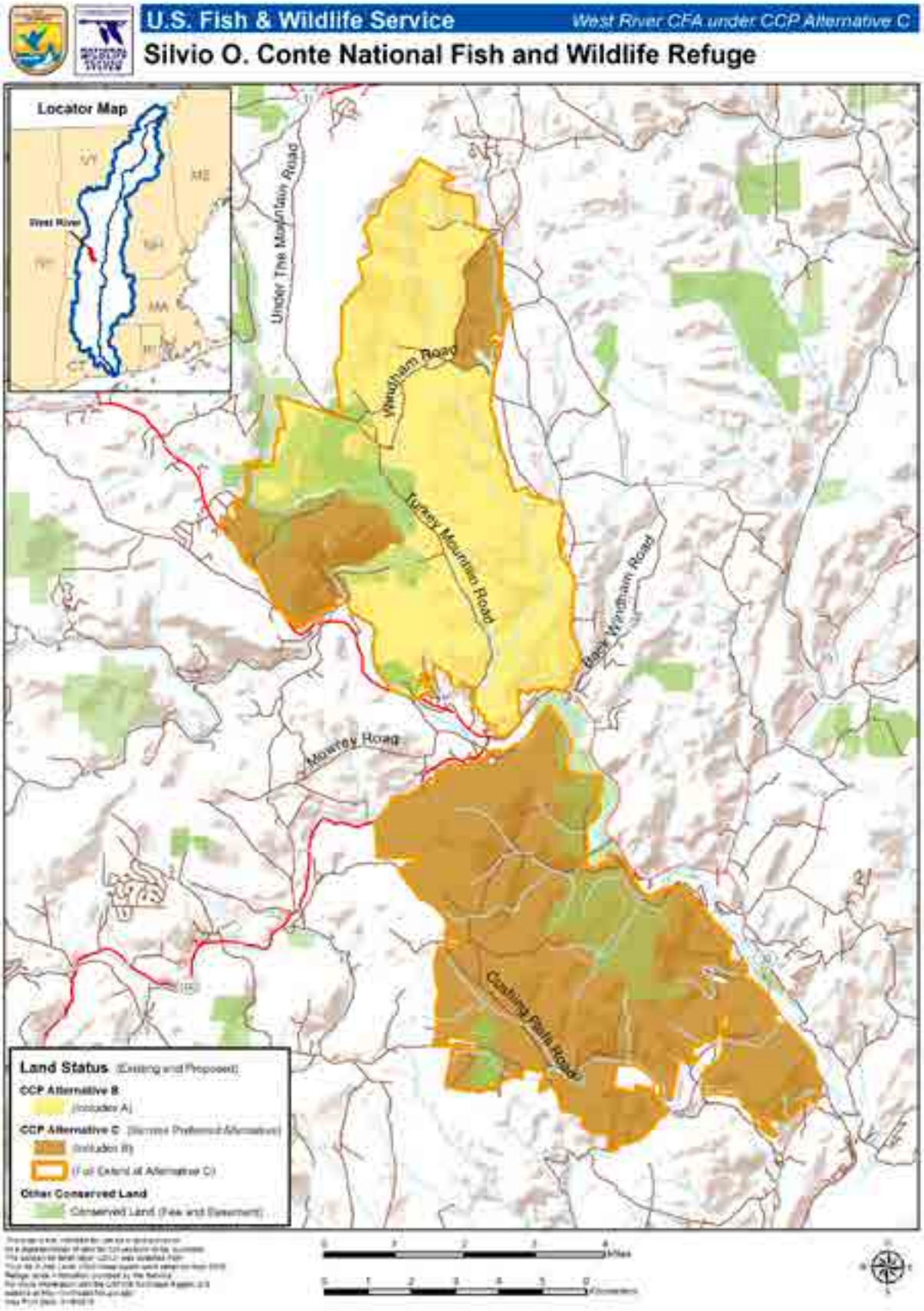
- Non-forest management activities will occur within wetland habitats, and pasture, hay, grassland habitats. Wetland management will focus on maintaining the natural hydrology and native species composition. Invasive plant management will be a priority.

- In open water (stream, rivers, and ponds) habitats, we will focus on maintaining forested stream buffers, a structurally diverse in-stream habitat, and uninterrupted aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

The National Wildlife Refuge System Improvement Act of 1997 identified hunting, fishing, wildlife observation, photography, interpretation, and environmental education as priority, wildlife-dependent uses. As such, these uses would receive priority on refuge lands.

*Map A.64. West River CFA – Location.*



*Map A.65. West River CPA/CFA – Habitat Types.*

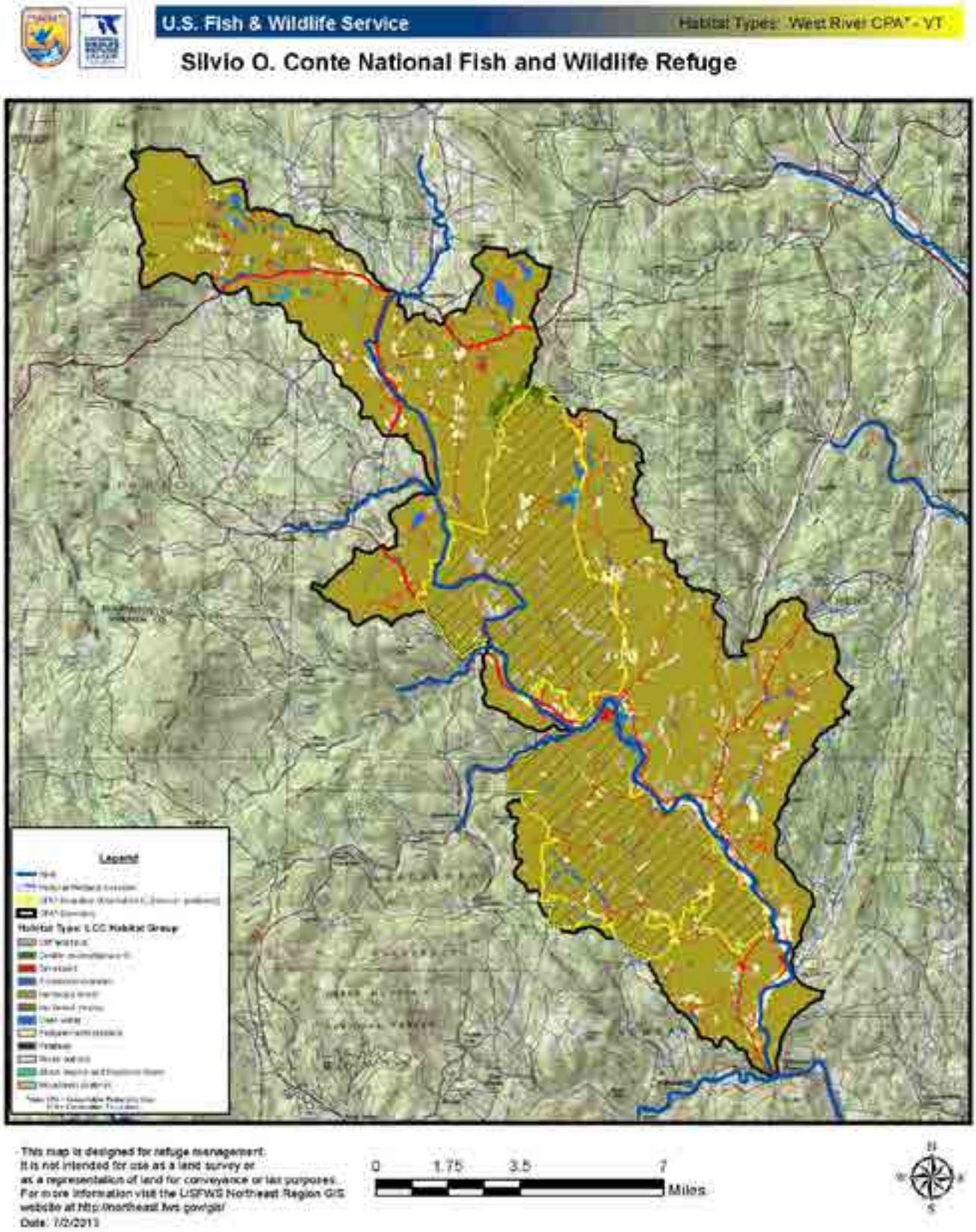


**Table A.47. West River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 776 | 1.0% | 130 | 6 | 0 | 0.5% | 16.7% |
| Hardwood forest | 69,355 | 85.0% | 23,442 | 3,364 | 0 | 89.8% | 33.8% |
| Hardwood swamp | 486 | 0.6% | 118 | 89 | 0 | 0.5% | 24.2% |
| Shrub swamp and floodplain forest | 309 | 0.4% | 54 | 4 | 0 | 0.2% | 17.7% |
| Woodlands (natural) | 532 | 0.7% | 144 | 48 | 0 | 0.6% | 27.0% |
| *Forested uplands and wetlands subtotal* | *71,458* | *87.5%* | *23,888* | *3,510* | *0* | *91.6%* | *33.4%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 983 | 1.2% | 463 | 175 | 0 | 1.8% | 47.1% |
| Freshwater marshes | 428 | 0.5% | 163 | 31 | 0 | 0.6% | 38.2% |
| Pasture/hay/grassland | 3,832 | 4.7% | 488 | 13 | 0 | 1.9% | 12.7% |
| Peatland | 10 | 0.0% | 1 | 0 | 0 | 0.0% | 11.6% |
| Rocky outcrop | 860 | 1.1% | 383 | 53 | 0 | 1.5% | 44.5% |
| *Non-forested uplands and wetlands subtotal* | *6,112* | *7.5%* | *1,498* | *272* | *0* | *5.7%* | *24.5%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 625 | 0.8% | 127 | 74 | 0 | 0.5% | 20.3% |
| *Inland aquatic habitats subtotal* | *625* | *0.8%* | *127* | *74* | *0* | *0.5%* | *20.3%* |
| **Other** | | | | | | | |
| Developed | 3,432 | 4.2% | 579 | 99 | 0 | 2.2% | 16.9% |
| *Other subtotal* | *3,432* | *4.2%* | *579* | *99* | *0* | *2.2%* | *16.9%* |
| **TOTAL** | **81,627** | **100.0%** | **26,091** | **3,955** | **0** | **100.0%** | **32.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternativ

**Table A.48. West River CFA – Preliminary Priority Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 23,537 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Baltimore Oriole[J]<br>Black-and-white Warbler[J]<br>Black-billed Cuckoo[A,I,J]<br>Northern Flicker[A, J]<br>Scarlet Tanager[J]<br>Ruffed Grouse[A, I]<br>Whip-poor-will[A, I, J]<br>**Louisiana Waterthrush**<br>Brown Thrasher[I]<br>**Ovenbird**[A]<br>**Eastern Red Bat**[I]<br>American Redstart[A, J]<br>Blackburnian Warbler[A]<br>Eastern Wood-pewee[A, J]<br>Red-shouldered Hawk[I, J]<br>Black-throated Green Warbler[A]<br>Sharp-shinned Hawk[J]<br>Yellow-bellied Sapsucker[A,J]<br>Rose-breasted Grosbeak[A]<br>Northern Parula[A]<br>Bobcat[I]<br>Long-tailed Weasel[I]<br>Woodland Vole[I]<br>Black Bear[I]<br>Veery[A,I]<br>Black-throated Blue Warbler[A,I]<br>Purple Finch[A] |
| American Woodcock[A, B, C] | Breeding and roosting habitat includes young deciduous and mixed forests (1-20 years old) dominated by aspen and birch, and 3+ acre forest openings with 60% shrub cover, in proximity to alder wetlands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | |
| **Chestnut-sided Warbler**[A, B, I] | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Blackburnian Warbler[A] | Breeding habitat includes mature conifer, and conifer-deciduous forests (80+ years old) (Degraaf et al. 2001, Hodgman et al. 2000, Dunn et al. 1997, Morse 2004). | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | |
| **Hardwood Swamp[5] - 118 acres** | | |
| Canada Warbler[A, B, C] | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 ft within >30% canopy closure, a dense foliar mid-story and well developed shrub layer 7-20' in height, and moist soils (Chace et al. 2009, Lambert et al. 2005, Dunn et al. 1997). | **Northern Waterthrush**<br>Red-shouldered Hawk[I,J]<br>Rose-breasted Grosbeak[A,J]<br>Veery[A,I,J]<br>White-eyed Vireo[J]<br>Willow Flycatcher[J]<br>Wood Duck[A,J]<br>Northern Parula[A] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Conifer Swamp[5] - 34 acres** | | |
| Laurentian-Acadian conifer-hardwood acidic swamp[H]<br><br>Laurentian-Acadian alkaline conifer-hardwood swamp[H] | The *conifer-hardwood acidic swamps* occur on mineral soils that are nutrient-poor; there may be an organic top soil horizon, but the substrate is generally not deep peat. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. Red maple, ash, red spruce (rarely Black spruce), and balsam fir are the most typical trees. The herbaceous and shrub layers tend to be fairly species-poor, and include catberry and ferns of the genus *Osmunda*. Northern white cedar is a diagnostic canopy species within the *alkaline conifer-hardwood swam*p. It may dominate the canopy or mixed with other conifers or deciduous trees, most commonly Red maple or Black ash. Red osier dogwood is a common shrub. The herb layer tends to be diverse, and small open areas fed by mineral rich waters may occur within the wetland (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Shrub Swamp and Floodplain Forest[5] - 54 acres** | | |
| American Woodcock[A, B, C] | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands and herbaceous openings (Kelley et al. 2008, Sepik et al. 1994). | Chestnut-sided Warbler[A, I]<br>Black Racer[I]<br>Ruffed Grouse[A, I]<br>Eastern Ribbon Snake[I, J]<br>**Warbling Vireo**<br>**Willow Flycatcher**<br>**Wood Turtle[I]**<br>American Redstart[A, J]<br>Eastern Kingbird[J]<br>Gray Catbird[J]<br>Wood Duck[A, J]<br>Veery[A,I] |
| American Black Duck[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Woodlands (natural)[5] - 144 acres** | | |
| Central Appalachian pine-oak rocky woodland[H]<br><br>Central Appalachian alkaline glade and woodland[H] | *The pine-oak rocky woodland system* encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire. The *alkaline glade and woodland system* consists of woodlands and open glades on thin soil over limestone, dolostone or similar calcareous rock. In some cases, the woodlands grade into closed-canopy forests. Eastern red cedar is a common tree, and chinquapin oak is indicative of the limestone substrate. In the northern periphery of the range, northern white cedar may replace eastern red cedar. Prairie grasses are the dominant herbs; forb richness is often high. Fire is an important natural disturbance vector. (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Rocky Outcrop[5] – 383 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | The Northern Appalachian-Acadian rocky heath outcrop system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. Red oak and various conifers, including White pine and Red spruce, are characteristic trees. Low heath shrubs, including Sheep laurel, Low-bush blueberry, Black huckleberry, and Black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Freshwater Marshes[5] - 163 acres** | | |
| **American Black Duck**[A, B, C, G] | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf et al. 2001). | Canada Goose[J]<br>Tapering Rush[I]<br>Greene's Rush[J]<br>Mallard[J]<br>Northern Harrier[A,I,J]<br>Clustered Sedge[I]<br>Great Blue Heron[I]<br>**American Bittern**[A,I]<br>Grass Rush[I]<br>Water Shrew[I]<br>Arrowleaf[I]<br>Wood Duck[J] |
| Northeastern Bulrush[B, D] | Inhabits herbaceous wetlands with seasonally fluctuating waterlevels (USFWS, 2006) | |
| **Peatlands – 1 acre** | | |
| Laurentian-Acadian acidic alkaline fen[H] | *Laurentian-Acadian acidic alkaline fens* are most abundant in areas of limestone bedrock, and widely scattered in areas where calcareous substrates are scarce. Shore fens, which are peatlands that are occasionally flooded along stream and lakeshores, are also included here because flooding tends to create moderately alkaline conditions. The vegetation may be grass-dominated, shrub-dominated, or a patchwork of the two; shrubby cinquefoil is a common diagnostic shrub. The herbaceous flora is usually species-rich and includes calcium loving grasses and forbs. Sphagnum dominates the substrate; star campylium moss is an indicator bryophyte. The edge of the basin may be shallow to deep peat over a sloping substrate, where seepage waters provide nutrients (Gawler 2008). | uncommon plant community within the landscape that contributes to BIDEH* |
| **Pasture/Hay/Grassland [5] – 488 acres** | | |
| American Woodcock[A, B, C] | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Kelley et al. 2008, Sepik et al. 1994). | Field Sparrow[J]<br>Northern Harrier[A,I,J]<br>Chestnut-sided Warbler[A,I]<br>**Bobolink**[A,I]<br>**Grasshopper Sparrow**[I]<br>**Eastern Meadowlark**[I] |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] – 463 acres** | | |
| Laurentian-Acadian acidic cliff and talus[H]<br><br>North-central Appalachian acidic cliff and talus[H]<br><br>North-central Appalachian circumneutral cliff and talus[H]<br><br>Laurentian-Acadian calcareous cliff and talus[H] | These cliff systems occur at low to mid elevations, well below treeline. The vegetation within the *Laurentian-Acadian acidic cliff and talus system* is patchy and often sparse, punctuated with patches of small trees such as birches and spruce species. Species that prefer calcium rich soils are absent. In north-facing or other sheltered settings where cold air accumulates at the bottom of slopes, a shrubland of heaths and reindeer lichens can develop. The *North Central Appalachian acidic cliff and talus system* comprises sparsely vegetated to partially wooded cliffs. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be comparatively well-developed and different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. Eastern red cedar is a characteristic tree species, poison ivy a characteristic woody vine, and common polypody a characteristic fern. Substrates within the *circumneutral cliff and talus system* include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. Ash, basswood, and American bladdernut are woody indicators of the enriched setting. The herb layer includes at least some species that are indicators of enriched conditions, e.g., yellow jewelweed, purple cliffbrake, ebony spleenwort, or bluntlobe cliff fern. *The calcareous cliff and talus system* has more nutrient rich soils, and the vegetation is often sparse, but may include patches of small trees including northern white cedar, which may be the dominate species. Ash species and basswood are woody indicators of the enriched setting (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5] – 127 acres** | | |
| Brook Floater[E] | Inhabits creeks and small rivers, prefers the stable bank conditions afforded by gravel or sandy substrates, and good water quality (Nedeau et al. 2000). | Eastern Pearlshell[I]<br>Wood Turtle[I]<br>Boulder-beach Tiger Beetle[I]<br>Riffle Snaketail[I]<br>Brook Snaketail[I]<br>Zebra Clubtail[I] |
| **Atlantic Salmon[B, F, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |
| **Brook Trout[F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | |
| **American Shad[B, F, G]** | Spawn when the water temperature is above 60° F in shoal area of river and lower reaches of larger tributaries (USFWS 1996). | |
| **American Eel[E, F]** | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996) | |
| Cobblestone Tiger-beetle[E] | Breeding and wintering habitat includes sparsely vegetated sandy cobble beaches on the banks or upstream side of islands in free-flowing rivers (Pyzikiewicz 2006). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.
B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.
C: 2008 USFWS Birds of Conservation Concern.
D: Federal Threatened and Endangered status as of 2010, including Candidate Species
E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010
F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan
G: Silvio O Conte Refuge Purpose Species.
H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.
I: 2005 Vermont Wildlife Action Plan (Species of Greatest Conservation Need)
J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Objectives and Strategies for Refuge Lands in the West River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forests)**
Improve the diversity of seral stages, (where and when possible) to restore historic composition and structure, and improve landscape connectivity of hardwood forests to facilitate climate change adaptation and support species of conservation concern. In particular, habitat management will provide breeding and foraging habitat for priority refuge resources of concern including wood thrush, Canada warbler, blackburnian warbler, chestnut-sided warbler and American woodcock.

***Rationale:***
We envision healthy forests within the West River CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Vermont's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et. al 2011).

The watershed of the West River is almost entirely forested, contributing to the high quality of its terrestrial and aquatic systems: rivershore grasslands, riverside outcrops, submerged beds of aquatic plants—including the rare riverweed, cold headwater streams, floodplain forests, northern hardwood forests, hemlock swamps, vernal pools and beaver ponds/meadows in various stages of succession. To date, our review of West River's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history common to larger New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within West River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983; Whitney 1996; Foster et al. 1997; Bellemare et al. 2002; Hall et al. 2002). Our sub-objective assumes the forests of West River are more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Foster et al. 1998; Foster 2000; Goodburn and Lorimer 1998; Cogbill 2002; Bellemare et al. 2002; Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management; the application of silvicultural treatments designed to emulate gap dynamics; and the creation of early successional forests, will promote compositional and structural diversity, and broadly move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within West River will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature (Kelley et al. 2008, Sepik et al. 1994). Across

the CFA, enhanced horizontal structure should support other species of conservation concern like chestnut-sided warbler, ruffed grouse, and—if wetlands and riparian areas are present—Canada warbler (Reitsma et al. 2008, Lambert et al. 2005, Chace et al. 2009).

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. West River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular importance to species like Canada warbler. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush and blackburnian warbler. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region. Improving vertical diversity by preserving softwood inclusions during forest management may provide an important habitat component for blackburnian warblers, who dwell in the upper canopies of conifers, and are thought to be strongly associated with the hemlock forests within West River. Blackburnian warblers have been shown to decline in response to removal of hemlock by hemlock wooly adelgid (Tingley et al. 2002).

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (>75-80% closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated green warbler, and—when along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for wildlife habitat and nutrient cycling. Structurally-sound, large-diameter trees are important nest sites for woodland raptors, such as the red-shouldered hawk. Standing trees that are dead and/or contain cavities will be present in all size classes for those species, like black bear, that require large logs or trees for their dens (Wynne and Sherburne 1984, Chapin et al. 1997, DeGraaf and Yamasaki 2001). Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Work with partners, including the State in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

- Identify forest stands where soils and species composition will support woodcock management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices.

- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Where appropriate maintain larger diameter trees to provide future snags and downed coarse woody debris.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.
- Monitor habitats to ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.

**Sub-objective 1.1b. (Hardwood Swamps)**
Improve the diversity of seral stages, (where and when possible) restore historic composition and structure, and improve the natural hydrology to support natural and rare ecological communities. Management will provide breeding and foraging habitat for priority refuge resources of concern including Canada warbler.

***Rationale:***
Of the forest types within the West River Conservation Focus Area (CFA), hardwood swamps frequently have been altered and have potential for restoration. This habitat type in West River is found in small patches where soils have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding of water common during wetter seasons and drought during the summer or autumn months. The dynamic nature of the watertable drives complexes of forest upland and wetland species including pin oak, red maple, sweetgum, and black gum. Within the Connecticut River watershed, including the CFA, agricultural practices, and selective logging have largely removed this habitat from the landscape, or greatly simplified its historic species composition (Foster 1992; Foster 2000). Changes in hydrology, water pollution, invasive species introductions, and soil compaction remain as threats.

Successional trends in hardwood swamps are not well understood. One possibility is that these areas were once in softwoods such as hemlock, fir, cedar, or spruce. Heavy cutting and clearing for agriculture often eliminated softwood species. Our conservation efforts within West River will focus on promoting the ecological integrity of these stands through restoration of degraded floodplains, and (where and when possible) restoring composition and structure to accepted historical conditions. Where appropriate, restoration of the primary natural disturbance mechanism (seasonal flooding) will aide in the restoration of historical species mixtures.

Restoration of forest habitats and riparian areas will create high-quality habitat for neotropical migratory birds. Closed canopy deciduous forests that include pin oak and other hardwoods provide mast and other foraging sites. Hardwood swamp stands with large average stand diameters, a variety of tree conditions (including large-diameter dead stems, live trees with hollow stems and dead limbs, and small diameter suppressed and dying stems), and nearby water have a high habitat potential for cavity-dwelling wildlife species (DeGraaf et al. 2006).

Many species of conservation concern use forested swamps, including northern parula, willow flycatcher, white-eyed vireo, and rose-breasted grosbeak. Canada warbler, a priority refuge resource of concern, occupies this habitat type with high densities occurring in mixed forested swamps (Reitsma et al. 2008, Lambert et al. 2005, Chace et al. 2009). The wet soil conditions in swamps limit the canopy closure, and frequent blow downs create canopy gaps. This provides a well developed shrub layer—an important habitat component for foraging and nest cover (Chace et al. 2009). Canada warbler shows area sensitivity

in forests fragmented by suburban sprawl (Robbins et al. 1989). Hardwood swamps in the West River CFA are within a matrix of contiguous forest, where fragmentation is not a concern. Hardwood swamp patches of ten acres or greater are thought to provide suitable breeding habitat for Canada warbler in the West River CFA, and allow monitoring of population response to management actions (R. Dettmers personal communication 2013).

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood swamps at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate hydrologic regime to inform restoration efforts.
- Identify forest stands where management is necessary to improve species composition. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Work with partners, including the State of Vermont, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified forest management opportunities to improve species composition.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Map vernal pools and seeps.
- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1c. (Shrub Swamps and Floodplain Forest)**
Manage shrub swamp and floodplain forest communities to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American woodcock and American black duck.

***Rationale:***
Shrub swamps are restricted to poorly drained areas, small seepage zones, and wide alluvial stretches of rivers and small streams. Shrubs tend to dominate the wetland, though grasses may be present. Typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush (Gawler 2008). These wetlands are also created through beaver activity, a natural and important disturbance process within the CFA. The landscape mosaic of flooded areas and ponds in various stages of succession provide a diversity of plant communities, and habitats for a variety of wildlife species, including American woodcock and American black duck, priority refuge resources of concern.

American woodcock are dependent on early-successional forests— a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like American woodcock, are declining as remaining patches of young forest mature. Woodcock require varying habitat conditions that are within close proximity of each other, including clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young deciduous forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Kelley et al. 2008, Sepik et al. 1994). Shrub swamps in the CFA may provide moist, rich soils for foraging and the dense shrubs provide cover from predators

Management of the shrub swamp communities may be required to maintain shrub dominance and stem densities. Tree species, such as red maple, tend to replace mature shrub species and established invasive plants compete for nutrients and space. These invading species require management in order to maintain the native shrub diversity of the community. A high shrub stem density is also important as it provides birds with cover from predators and more leaf surface area for gleaning. Cover for American woodcock, for example, is ideal in a 10-15 year old shrub swamp (USDA 2001). Shrub species, in particular alder, tend to die back as they reach maturity, and as a result stem density decreases. Periodic rejuvenation of shrubs is necessary to maintain required stem densities. Management priority will be given to shrub swamps that are part of a woodcock management area. Management of these shrub swamps will benefit other species that use these communities, including willow flycatcher, American redstart, chestnut-sided warbler, ruffed grouse, black racer, and eastern ribbon snake.

American black ducks also use shrub swamp communities, though black ducks prefer shrub swamps that are flooded or adjacent to open water habitats. Black ducks rely on these wetlands during the breeding season and as stopover habitat during migration. Adults and their broods forage on seeds, aquatic vegetation, and invertebrates in flooded shrub swamp communities, or adjacent open water habitats. Adults place well-concealed nests near foraging habitat in nearby uplands or dry hummocks in the wetland (Longcore et al. 2000, DeGraaf et al. 2001). American black duck is a species of concern in the North American Waterfowl Management Plan because of historic population declines, and is listed as highest priority for conservation in BCR 14. Protecting and managing these shrub wetland communities from potential threats, including invasive species introduction, altered hydrology, and fragmentation, will contribute to the conservation of this species.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of shrub swamps at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

**Sub-objective 1.1d. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize

that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987; Hunter 1991; Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the West River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support natural and rare ecological communities, and provide potential breeding and foraging habitat for priority refuge resources of concern including American black duck, and maintain the natural water level variability in wetlands where the federally listed northeastern bulrush occurs.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the West River watershed.

Our coarse-scale habitat analysis of this CFA identifies these wetlands as scattered throughout the CFA with the largest freshwater marsh acreage occurring within a large wetland complex adjacent to the Townshend Reservoir. This particular wetland complex, adjacent to open water habitat, may provide important breeding and foraging habitat for American black duck, and other waterfowl species. Located within the Connecticut River watershed, an important migration corridor, this area may also be important as staging areas for migrating waterfowl. An evaluation of the wetlands in the CFA will be necessary to determine their potential as habitat for waterfowl species.

The northeastern bulrush, a wetland plant, occurs in isolated small wetlands in the CFA. This species is federally listed, and has adapted to seasonal water fluctuations. Habitat alterations that change the hydrology of a wetland to be consistently wet or dry may have negative consequences for this species. Biologists are currently monitoring known populations, but more information is needed on the habitat requirements, reproductive strategy, and genetic variability (USFWS 2006). Research, and preventing habitat destruction and deterioration of wetland sites where this plant is found are crucial steps to maintaining this northeastern bulrush populations.

Implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife habitat inventory. Wildlife species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent habitat conditions and land uses within the CFA and associated landscape. Baseline information on the condition of freshwater marshes at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Encourage local landowners to use Vermont Best Management Practices within active agricultural fields that are located along the perimeter of marsh habitats.
- Explore and support research opportunities with academic partners to address information gaps for northeastern bulrush.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.
- Work with the State Natural Heritage Program to annually monitor the presence/absence of current northeastern bulrush populations in emergent wetlands.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) as part of a mosaic of habitat conditions required by American woodcock and other shrub-dependent conservation concern species such as chestnut-sided warbler. Also maintain large contiguous tracts of grassland habitat, if present and appropriate.

***Rationale:***
More than two percent of the West River CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow. American woodcock, a refuge priority resource of concern, will use both habitat conditions when managed in conjunction with their other habitat needs.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline. However, large and contiguous grasslands are rare in the watershed, and large grassland habitat patches are important to high priority grassland species and overall biological diversity. We will maintain large grassland patches (e.g. 500 acres), or areas where a high proportion of grassland cover is present in the landscape (e.g., a mosaic of many medium to large patches).

Shrubland and grassland habitats will also be used by American woodcock, which require diverse structural habitat conditions within close proximity of each other: clearings for courtship, forest openings with sparse shrub or herbaceous cover for roosting, young hardwood forests of shade intolerant tree species for nesting and brood rearing, and functional foraging areas (Sepik et al. 1994, Kelley et al. 2008). Small clearings with minimal vegetation is required for courtship areas, and shrublands with clumps of tall vegetation or sparse shrubs will provide roosting habitat.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Large, contiguous grassland habitats are also important to a suite of priority grassland bird species. Current pasture, hay, and grassland acres can provide quality habitat, for these species, and American woodcock, if managed appropriately. Baseline information on the condition of these habitats and association with other landscape features will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Conduct an inventory of these habitats to determine their condition, size and location, which will inform and prioritize appropriate management strategies in the HMP.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
See rationale for objective 1.1d.

Habitats that occur within the West River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Specific Sub-objectives to apply on refuge lands for aquatic habitats:**

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and unimpeded aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout, American shad, American eel, Atlantic salmon and brook floater, as well as other species of conservation concern such as sea lamprey. Maintain and protect the cobble shores of the West River, especially in areas that provide suitable habitat for the cobblestone tiger beetle.

***Rationale:***
The West River flows through the northern portion of the CFA, and along the eastern boundary as it enters and exits the Townshend Reservoir. The West River has been rated as having the highest abundance of high quality open water habitat as measured by a Vermont Index of Biotic Integrity, a measure of fish community health. It has a wide range of representative reaches extending from its headwaters to its mouth supporting diverse assemblages of fish species. The West River is also considered representative for assemblages of mussels and invertebrates in several locations, including Cobb Brook, which flows through the northern portion of the CFA.

The main stem and tributaries provide high quality cold water habitat for brook trout and Atlantic salmon. Brook trout and Atlantic salmon are sensitive to extreme temperature fluctuations, and require water temperatures between 40 to 70 degrees Fahrenheit for spawning, growth, and survival. The lower West River provides habitat for warm water species as well as diadromous fish such as American shad and American eel. Other species that occur in the West River CFA include yellow perch, creek chub, white sucker, pumpkinseed, carp, slimy sculpin, and blacknose dace. These species are hosts for the earliest life stages of resident mussels.

Another species of conservation concern that utilize freshwater aquatic habitats in this CFA is sea lamprey. Sea lamprey enter the Connecticut River and tributaries to reproduce, and in the process provide important ecological benefits to aquatic systems. Adults transport nutrients between freshwater and saltwater systems, their nest construction restores and enhances streambed structure, abandoned nests are used by other riverine fish, and lamprey eggs and larvae provide food for a variety of species (Kircheis 2004). As with many riverine fish, sea lamprey movement is impeded by barriers on the main stem and tributaries.

There is potential habitat for cobblestone tiger beetle, a species that has been petitioned for federal listing, within the West River CFA. This tiger beetle prefers sparsely vegetated sandy cobble beaches (Pyzikiewicz 2006). The West River provides these habitat conditions, and the cobblestone tiger beetle has been found in the watershed. This tiger beetle is also listed as state-endangered. Other species of concern that occur in the West River Watershed (not necessarily in the CFA) include the State-threatened brook floater mussel and eastern pearlshell, eleven state rare plant species, as well as historic records of the federally listed dwarf wedgemussel.

The Townshend Reservoir is located in the northern portion of the CFA. This man-made lake is associated with the Townshend Dam, which was built on the West River in 1961 by the U.S. Army Corps of Engineers to prevent flooding along the Connecticut River. This lake is managed by Vermont Fish and Wildlife Department and the Army Corps of Engineers, and supports rainbow, brown and brook trout, yellow perch, largemouth bass and bullhead.

Management of water resources in the West River CFA will focus on rivers and streams that provide uninterrupted aquatic species passage to spawning and wintering habitat and provide structurally diverse in-stream habitat. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of open water habitat will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.
- Conduct stream assessments to identify man-made physical barriers (e.g., impassable road crossings, culverts, and dams) to the movement of fish and other aquatic organisms.
- Work with partners to monitor the West River for the cobblestone tiger beetle.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not Applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not Applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the West River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the West River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the West River Division as an outdoor classroom

***Rationale:***
Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the West River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the West River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA-compliant trail anticipated for the site, the West River Division would be well suited to

support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the West River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate the CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the West River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the West River Division.
- Incorporate thematic statements, measureable objectives and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the West River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the West River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below.

***Rationale:***
The West River CFA is a popular area to hunt white-tailed deer, Eastern wild turkey, black bear, and small game. Hunting will be allowed on a newly created division, consistent with the final compatibility determination. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e., 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.

- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring sufficient land to support hunting seasons:*
- Work with Vermont Fish and Wildlife Department to determine whether opportunities exist for state-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Work with Vermont Fish and Wildlife Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*
- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at West River Division kiosks, through a friends group, and in local businesses.

- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.

- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*
- Work with Vermont Fish and Wildlife Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.

- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access, and Infrastructure)**
Provide quality fishing opportunities at the West River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Vermont Fish and Wildlife Department regulations, and any division-specific conditions.

***Rationale:***
There are several streams in the proposed CFA including the West River, Cobb Brook, Turkey Mountain Brook, Little Turkey Mountain Brook, Fair Brook, Negro Brook, Wardsboro Brook, Smith Brook, and Ranney Brook. A variety of game fish are found in these streams and fishing opportunities exist for several trout species. Fishing is a popular activity and would continue under Service ownership. Retaining fishing opportunities conforms to historic use within the CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The West River Division would be open daily to all visitors, including anglers, from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters.

*Within 5 years of acquiring land with fishable waters:*

- Work with the Vermont Fish and Wildlife Department to inventory and assess fish populations on the division.
- Work with the Vermont Fish and Wildlife Department to evaluate potential fishing enhancements, as appropriate.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available at the refuge website, refuge offices, division kiosks, through friends groups, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. Local organizations such as Vermont Audubon chapters and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.
- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring sufficient land:*

- Develop a public access strategy and required planning (e.g., NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring sufficient land:*

- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.

- Encourage local schools and groups such as a local chapter of Vermont Audubon and other environmental organizations to offer wildlife-centered trips to the refuge.

- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring sufficient land:*
- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the West River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Where appropriate, we will work with these partners to promote and distribute information about these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*
- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that are part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the West River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional land-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as wildlife observation and photography. Examples include regional hiking trails and regional snowmobile trails part of the Vermont Association of Snow Travelers (VAST) system. When determined appropriate and compatible, we will work with these partners to promote and distribute information about these opportunities.

*Within 1 year of acquiring sufficient land:*
- On newly acquired land that contains an existing snowmobile trail that is part of the VAST system, determine if maintaining the trail on the refuge is appropriate and compatible. If found appropriate and compatible, work with VAST and the responsible local snowmobile club to manage snowmobile use under a special use permit.

*Within 5 years of acquiring land:*
- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Develop compatible opportunities on the West River Division that support initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of acquiring sufficient land:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# White River Conservation Focus Area (Proposed)

## Stockbridge and Killington, Vermont

| Conservation Focus Area (CFA)—Acreage Profile | Acres | Percentage of CFA |
|---|---|---|
| Total CFA Acres to be Conserved by Service | 10,031 | 88.8% |
| ■ *Existing Refuge Ownership in CFA*[1] | *0* | |
| ■ *Additional Acres in CFA proposed for Refuge Acquisition*[2] | *10,031* | |
| Existing Acres in CFA Permanently Conserved by Others[2,3] | 1,267 | 11.2 % |
| Total Acres in CFA[2, 4] | 11,298 | 100 % |

[1]Acres from Service's Realty program (surveyed acres); [2]Acres calculated using GIS; [3]The Service does not plan to acquire existing conserved lands, except under extenuating circumstances (conserved acres from TNC 2010 data); [4]The Service would conserve up to this number of acres. The Service only acquires lands from willing sellers.

## What specific criteria and/or considerations drove the selection of this CFA?

The White River is one of the best examples of its river type in Vermont for fish and macroinvertbrates (Langdon et al. 1998) and was identified by the State of Vermont as a high priority river corridor that provides habitat for many of the State species of greatest conservation concern (VFWD personal communication 2011). The White River, including several of its major tributaries, was an SFA in the 1995 Conte FEIS. The proposed White River CFA is located within a large network of conserved lands, including the Green Mountain National Forest, Gifford Woods State Park, the White River Stream Bank and Les Newell Wildlife Management Areas, and extensive Vermont Land Trust conserved areas. Additional land protection by the Service in this area will help better connect these conserved lands. The area is also expected to be relatively resilient to climate change impacts in the future. The Appalachian Trail Corridor, which crosses the proposed CFA, provides outstanding recreational opportunities.

## What are the priority habitat types within the proposed CFA? What percentage of the total CFA acreage do they represent?

- Hardwood Forest – 90%

See map A.67 and table A.49 for more detailed habitat information for the CFA.

## What are the resources of conservation concern for the proposed CFA?

As noted in table A.50 below, there are nine refuge Priority Refuge Resources of Concern (PRRC) terrestrial and aquatic species that may rely upon the diverse habitats in this CFA. There are also habitat types that are not being managed for a particular PRRC species, but are important for their contribution to Biological Integrity Diversity and Environmental Health (BIDEH) of the landscape. The refuge will seek to protect and restore (if necessary) these habitat types. Additionally, we recognize the value of this area to species that require large contiguous forest tracts including American black bear, bobcat and forest interior dwelling bird species. These species and others are discussed further below.

1. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The White River CFA not only provides important stopover habitat for migrating landbirds, but breeding habitat as well.

The PRRC species for the White River CFA include wood thrush and chestnut-sided warbler. This CFA is located in their core breeding range, and the contiguous forests provide breeding habitat for these and other forest nesting birds, many of which are priority conservation concern species. Over 91% of the CFA is contiguous forest, interspersed with riparian, cliff and talus, and rocky outcrop communities. Peregrine falcon is another PRRC species, as well as a State Species of Greatest Conservation Need (SGCN). The cliff and talus systems in the CFA are used by nesting peregrine falcons, where the elevations can rise above 2,600 feet.

2. **Diadromous fish and other aquatic species**
   The PRRC species for the White River CFA include brook trout and Atlantic salmon. The White River is the longest free-flowing tributary to the Connecticut River, and flows through the White River CFA. The many brooks that flow into the White River, such as Fletcher Brook, Stony Brook, Taggart Brook, Broughton Brook and Boutwell Brook, provide high quality cold water habitat for these species. Within Vermont, the White River has been identified as a high-quality river that supports healthy, native populations of macroinvertebrates and fish (Langdon et al. 1998). Brook trout and salmon are also high conservation concern for the State and the Service's Northeast Region.

3. **Other**
   The White River CFA southern boundary is within 2 miles of the abandoned Bridgewater Mines, which were used by over a hundred hibernating little brown, tricolored, big brown and northern long-eared bat species. These mines are no longer being used by bats due to decimation by white-nose syndrome. The northern long-eared bat was recently listed as federally threatened. Little brown, tricolored and eastern small-footed bats are undergoing review for listing under the ESA, and are a PRRC. Little brown bat and tricolored bat are currently being assessed for candidate status and eastern small-footed bat have been petitioned for listing under the ESA. The habitats within the CFA may still provide current or future roosting, feeding and potential maternity sites.

   The rocky outcrops and forested habitats within the CFA provide denning sites for American black bear and bobcat, as well as a contiguous landscape for these wide ranging mammals to breed and disperse.

## What habitat management activities would likely be a priority on refuge lands within the proposed CFA?

We will conduct a comprehensive, multi-scale wildlife habitat inventory following acquisition. Baseline information on the condition of habitats (ie. forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down Habitat Management Plan. Once inventory has been completed, then management will focus on maintaining the following conditions:

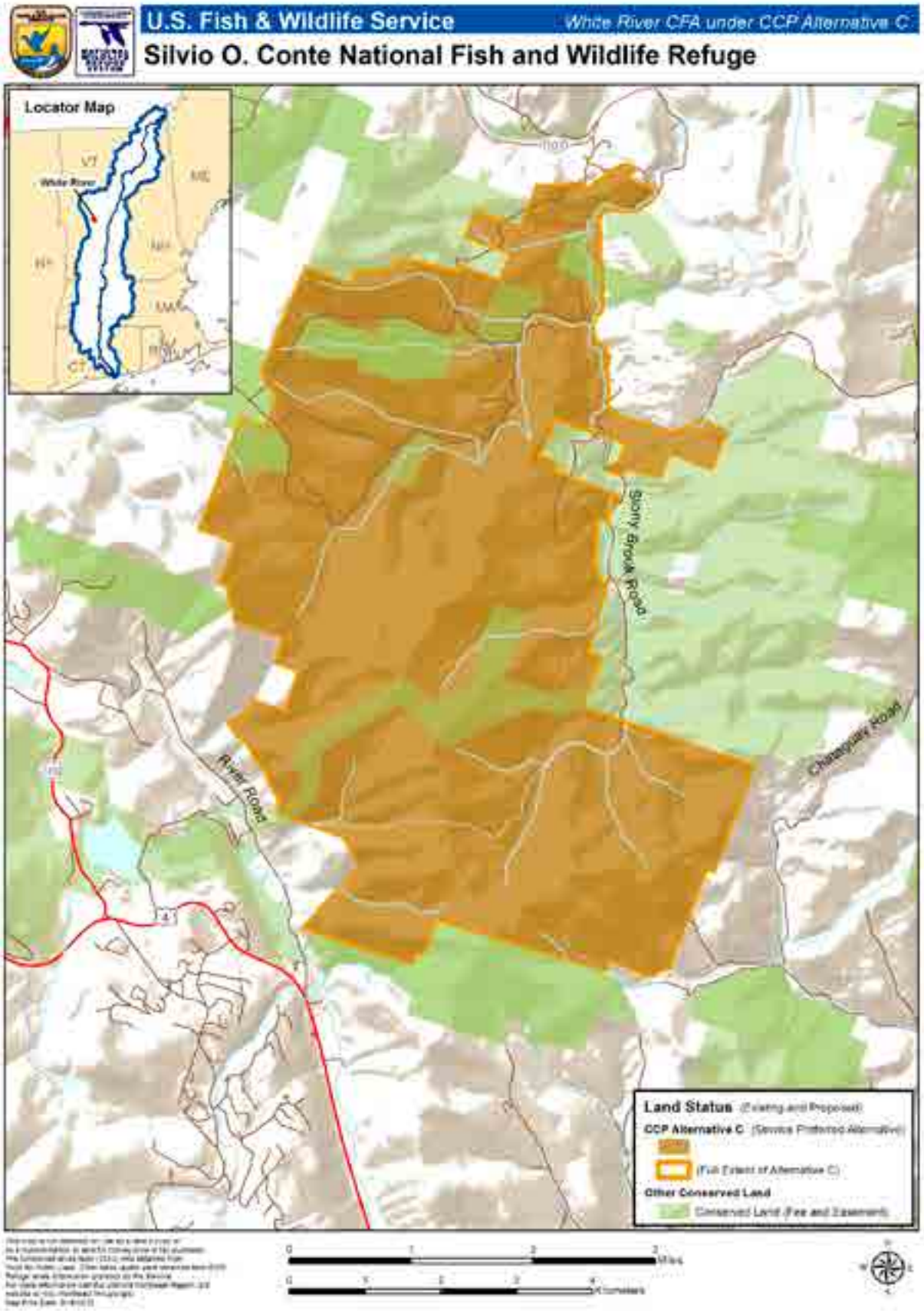
- Forest management activities will provide a diversity of seral stages including early successional and mature forested habitats. The forests in the CFA will be structurally diverse and appropriate for site conditions and location. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Open water (stream, rivers) will focus on maintaining forested stream buffers, a structurally diverse instream habitat, and clear aquatic species passage to spawning and wintering habitat.

## What public use opportunities would likely be a priority on refuge lands within the proposed CFA?

The National Wildlife Refuge System Improvement Act of 1997 identified hunting, fishing, wildlife observation, photography, interpretation, and environmental education as priority, wildlife-dependent uses. As such, these uses would receive priority on refuge lands.

*Map A.66. White River CFA – Location.*



*Map A.67. White River CPA/CFA – Habitat Types.*

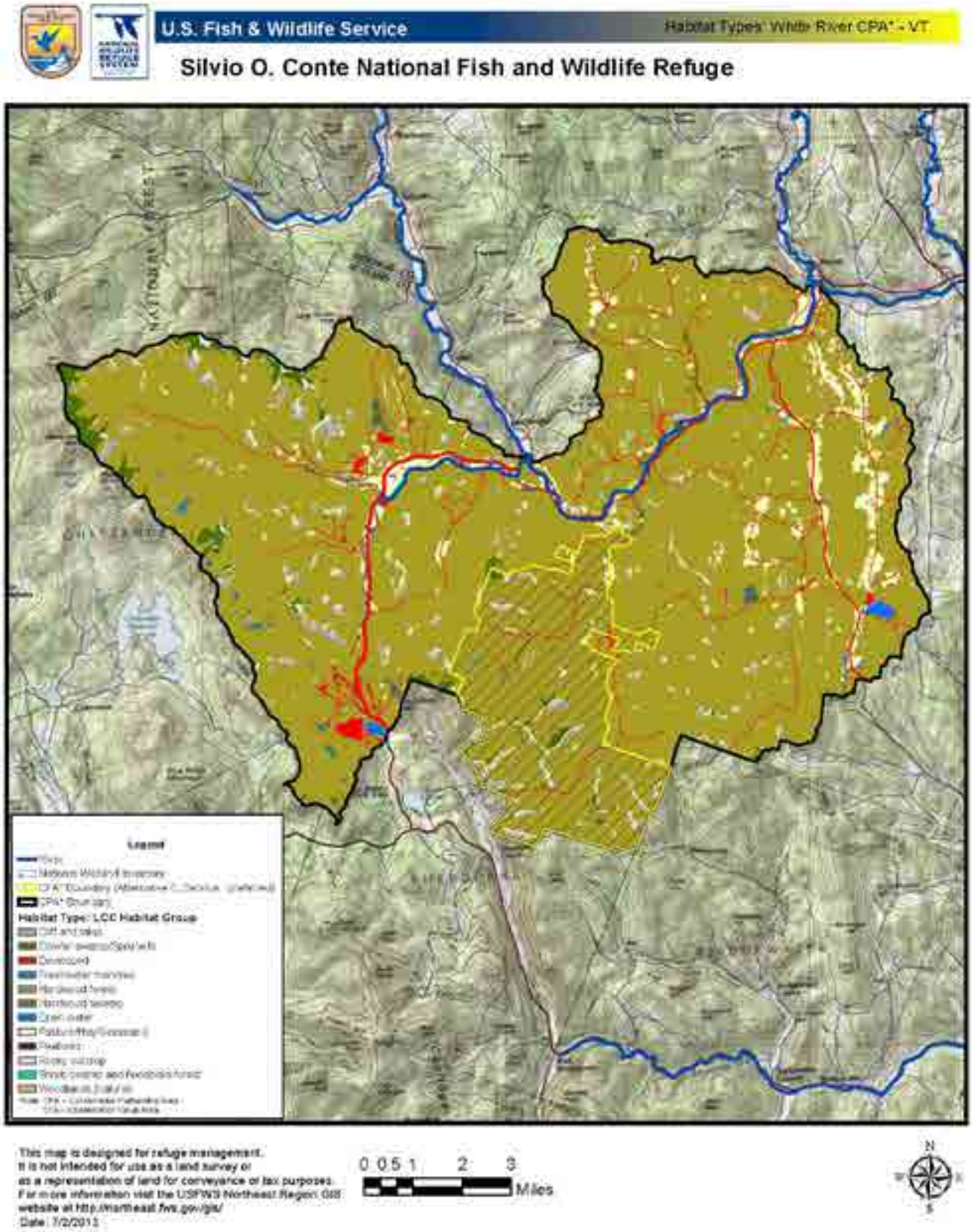


**Table A.49. White River CPA/CFA – Habitat Types.**

| LCC General Habitat Type[1] | CPA[2] | | CFA[3] | | | | |
|---|---|---|---|---|---|---|---|
| | Total Acres | Percent of CPA[4] | Total Acres | Conserved by Others[5] | USFWS Owned[6] | Percent CFA[7] | Percent Habitat[8] |
| **Forested Uplands and Wetlands[9]** | | | | | | | |
| Conifer swamp/spruce-fir | 1,787 | 2.1% | 184 | 63 | 0 | 1.6% | 10.3% |
| Hardwood forest | 71,568 | 85.7% | 10,160 | 1,087 | 0 | 90.0% | 14.2% |
| Hardwood swamp | 53 | 0.1% | 0 | 0 | 0 | 0.0% | 0.0% |
| Shrub swamp and floodplain forest | 80 | 0.1% | 1 | 0 | 0 | 0.0% | 0.8% |
| Woodlands (natural) | 52 | 0.1% | 1 | 1 | 0 | 0.0% | 1.3% |
| *Forested uplands and wetlands subtotal* | *73,540* | *88.1%* | *10,345* | *1,151* | *0* | *91.6%* | *14.1%* |
| **Non-forested Uplands and Wetlands[9]** | | | | | | | |
| Cliff and talus | 1,307 | 1.6% | 228 | 13 | 0 | 2.0% | 17.4% |
| Freshwater marshes | 104 | 0.1% | 2 | 0 | 0 | 0.0% | 1.5% |
| Pasture/hay/grassland | 3,314 | 4.0% | 64 | 8 | 0 | 0.6% | 1.9% |
| Peatland | 4 | 0.0% | 3 | 0 | 0 | 0.0% | 65.0% |
| Rocky outcrop | 2,141 | 2.6% | 497 | 82 | 0 | 4.4% | 23.2% |
| *Non-forested uplands and wetlands subtotal* | *6,871* | *8.2%* | *793* | *103* | *0* | *7.0%* | *11.5%* |
| **Inland aquatic habitats[9]** | | | | | | | |
| Open Water | 288 | 0.3% | 0 | 0 | 0 | 0.0% | 0.0% |
| *Inland aquatic habitats subtotal* | *288* | *0.3%* | *0* | *0* | *0* | *0.0%* | *0.0%* |
| **Other** | | | | | | | |
| Developed | 2,791 | 3.3% | 155 | 16 | 0 | 1.4% | 5.5% |
| *Other subtotal* | *2,791* | *3.3%* | *155* | *16* | *0* | *1.4%* | *5.5%* |
| **TOTAL** | **83,490** | **100.0%** | **11,293** | **1,270** | **0** | **100.0%** | **13.5%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - Conservation Partnership Area

3 - Conservation Focus Area; representing Service - preferred Alternative C

4 - Percentage of the CPA represented by the habitat type

5- Acres in the CFA currently conserved by others (TNC 2012)

6 - Acres in the CFA currently owned by the USFWS

7 - Percentage of the CFA represented by the habitat type

8 - Percentage of a given habitat within the CPA protected within the CFA under Alternative C

9 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

**Table A.50. White River CFA – Preliminary Priority Resources of Concern.**

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Hardwood Forest[5] - 10,334 acres** | | |
| **Wood Thrush**[A, B, C] | Breeding habitat includes contiguous mature forests (80+ years old) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). | Baltimore Oriole[J]<br>Black-and-white Warbler[J]<br>Black-billed Cuckoo[A,I,J]<br>Broad-winged hawk[J]<br>Rose-breasted Grosbeak[A]<br>Northern Flicker[A, J]<br>Scarlet Tanager[J]<br>Ruffed Grouse[A, I]<br>Whip-poor-will[A, I, J]<br>**Louisiana Waterthrush**<br>Brown Thrasher[I]<br>Blackburnian Warbler[A]<br>**Ovenbird**[A]<br>**Eastern Red Bat**[I]<br>American Redstart[A, J]<br>Eastern Wood-pewee[A, J]<br>Red-shouldered Hawk[I, J]<br>Black-throated Green Warbler[A]<br>Black-throated Blue Warbler[A,I]<br>Yellow-bellied Sapsucker[A,J]<br>Bobcat[I]<br>Long-tailed Weasel[I]<br>Woodland Vole[I]<br>Black Bear[I]<br>Veery[A,I] |
| **Chestnut-sided Warbler**[A, B] | Early successional deciduous forested upland and wetland habitat (Dunn et al, 1997, Richardson et al, 1995) | |
| Little Brown Bat[B,E]<br>Tri-colored Bat[E]<br>Northern Long-eared Bat[E]<br>Eastern Small-footed Bat[E] | Caves used for hibernation. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/nesting. Maternity trees (8”-14” dbh) and travel corridors to water are also important (Degraaf et al, 2001, Darling Guidelines, unpublished). | |
| **Conifer Swamp[5] - 10 acres** | | |
| Laurentian-Acadian conifer-hardwood acidic swamp[H] | The *conifer-hardwood acidic swamps* occur on mineral soils that are nutrient-poor; there may be an organic top soil horizon, but the substrate is generally not deep peat. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. Red maple, ash, red spruce (rarely Black spruce), and balsam fir are the most typical trees. The herbaceous and shrub layers tend to be fairly species-poor, and include catberry and ferns of the genus *Osmunda* (Gawler 2008). | uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Forested Uplands and Wetlands[4]** | | |
| **Shrub Swamp and Floodplain Forest[5] - 1 acre** | | |
| Laurentian-Acadian wet meadow-shrub swamp[H] | *Wet meadow-shrub-swamps* are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and grass dominance; typical species include willow, silky dogwood, speckled alder, white meadowsweet, bluejoint, tall sedge, and common rush. Trees are generally absent and, if present, are scattered (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Woodlands (natural)[5] - 1 acre** | | |
| Central Appalachian pine-oak rocky woodland[H] | This system of the central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes. The substrate rock is granitic or of other acidic lithology. The vegetation is patchy, with woodland as well as open portions. Pine species are indicative and often are mixed with Oak species. Some areas have a fairly well-developed heath shrub layer, others a grass layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Cliff and Talus[5] - 228 acres** | | |
| Peregrine Falcon[C, G] | Nests on cliffs, ledges, and talus slopes near open habitats including rivers, lakes, and marshes, and lack of human disturbance (DeGraaf et al. 2001). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Freshwater Marshes[5] - 2 acres** | | |
| Laurentian-Acadian freshwater marsh[H] | These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Vegetation includes common bulrush, narrow-leaf cattail, marsh fern, common jewelweed and sedges (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Pasture/Hay/Grassland [5] – 64 acres** | | |
| Where appropriate and supported by the local community, restore to forest habitat types | See species composition and structure above. | See species associated with forested habitat types above. |
| **Peatland [5] – 3 acres** | | |
| Boreal-Laurentian-Acadian acidic basin fen[H] | These fens have developed in open or closed relatively shallow basins with nutrient-poor and acidic conditions. The substrate is sphagnum, and vegetation typically includes areas of dominance by grasses and dwarf-shrubs. Leatherleaf is usually present, and scattered stunted trees may occur. These fens often develop adjacent to open water (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |
| **Non-Forested Uplands and Wetlands[4]** | | |
| **Rocky Outcrop[5] – 497 acres** | | |
| Northern Appalachian-Acadian rocky heath outcrop[H] | The *Northern Appalachian-Acadian rocky heath outcrop* system occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. red oak and various conifers, including white pine and red spruce, are characteristic trees. Low heath shrubs, including sheep laurel, lowbush blueberry, black huckleberry, and black chokeberry are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open (Gawler 2008). | Uncommon plant community within the landscape that contributes to BIDEH* |

| Priority Refuge Resources of Concern[1] | Habitat Structure[2] | Associated Species[3] |
|---|---|---|
| **Inland Aquatic Habitats[4]** | | |
| **Water[5]** *(GIS data did not capture acreage due to dense forest cover along small stream and river corridors)* | | |
| **Brook Trout[F]** | Spawning habitat includes clear, well oxygenated cold water lakes/ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures and stream flow (VTWAP 2005). | Blacknose Shiner[I]<br>Riffle Snaketail[H]<br>Brook Snaketail[H]<br>Zebra Clubtail[H] |
| **Atlantic Salmon[F, G]** | Spawn in cold freshwater moving streams w/ coarse clean gravel and adequate food/cover. Migrate in large rivers (VTWAP 2005). | |

1 - These species of conservation concern and associated habitats, as well as under-represented and sensitive ecological systems constitute the management focus for the CFA, and recommended for the CPA. They were identified based on specific criteria, and are included in the following plans, databases and/or have Federal status.

A: 2008 Bird Conservation Region 14.

B: 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.

C: 2008 USFWS Birds of Conservation Concern.

D: Federal Threatened and Endangered status as of 2010, including Candidate Species

E: Federal Elevated Concern species or species petitioned for threatened and endangered listing as of 2010

F: 2009-2013 USFWS Northeast Region Fisheries Program Strategic Plan

G: Silvio O Conte Refuge Purpose Species.

H: 2008 North East Terrestrial Habitat Classification System.

2 - This habitat structure will benefit the listed priority refuge resources of concern, and is based on the most recent literature.

3 - These species are a compilation from the following plans, and are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the priority species. This is not a comprehensive list of species.

A:2008 Bird Conservation Region 14.

I: 2005 Vermont Wildlife Action Plan (Species of Greatest Conservation Need)

J: 2012 Terrestrial and Wetland Representative Species of the North Atlantic: Species Selected, Considered, and Associated Habitats (Ecological Systems). These species were LCC candidate species and are represented by the selected LCC Representative Species.

4 - CCP Objectives from Silvio O. Conte NFWR Comprehensive Conservation Plan, Chapter 4, Service - preferred Alternative.

5 - These habitat types are based on the North Atlantic Landscape Conservation Cooperative (NALCC) habitat groupings for associated Representative Species, which were derived from The Northeastern Terrestrial Habitat Classification System (NETHCS). See table A.52 for a comparison of the NALCC habitat groupings and NETHCS.

BOLD - These species are LCC Representative Species, which is a species that, because of its habitat use, ecosystem function, or management response, typifies lifecycle or habitat requirements for a larger group of species.

* The Refuge Improvement Act directs the US Fish and Wildlife Service to maintain Biological Integrity, Diversity, and Environmental Health (BIDEH). Elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them.

# Goals, Objectives, and Strategies for Refuge Lands in the White River CFA under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1a. (Hardwood Forest)**
Improve the diversity of seral stages and (where and when possible) restore historic composition and structure, and improve landscape connectivity of hardwood forest habitat to support species of conservation concern and aid in climate change adaptation. Management will provide breeding and foraging habitat for priority refuge resources of concern, including wood thrush, chestnut-sided warbler, and cave dwelling bats.

***Rationale:***
We envision healthy forests within the White River CFA where a diverse seral structure provides suitable breeding and post-breeding habitat conditions for a suite of Vermont's wildlife. Our long-term vision for the CFA includes hardwood forests characterized by complex horizontal and vertical structure, a generally closed canopy, large-diameter trees, dead woody material, snags and cavity trees, native species diversity, softwood inclusions, and a diversity of wildlife (Foster et al. 1996, Goodburn and Lorimer 1998, Keeton 2006, D'Amato et al. 2009, Curzon and Keeton 2010, Fraver et al. 2011).

The Upper White River watershed has been identified by Audubon Vermont as important breeding habitat for a number of responsibility birds that have a high proportion of their global population breeding in the region. To date, our review of White River's habitats and wildlife species—and their condition—has been limited to coarse-scale information: the careful analysis of spatially-explicit habitat data using GIS, the consultation of local, state, and regional species conservation plans, and an understanding of forest disturbance and land-use history in New England. This allowed identification of broad habitat types, and species of conservation concern known to utilize characteristics common to these habitats. Our understanding of the forest structure within White River comes exclusively from a reading of forest history in New England—a legacy of intensive past-use that altered the vegetation structure and composition, landscape patterns, and ongoing ecological dynamics (Cronon 1983, Whitney 1996, Foster et al. 1997, Bellemare et al. 2002, Hall et al. 2002). Our sub-objective assumes the forests of White River are more homogeneous than those of three centuries earlier, and they include more sprouting and shade-intolerant species and fewer long-lived mature forest tree species (Goodburn and Lorimer 1998, Foster et al. 1998, Foster 2000, Bellemare et al. 2002, Cogbill et al. 2002, Abrams 2003). Completing a comprehensive forest and habitat inventory post-acquisition will test these assumptions, and aid in identifying stands where a forest management approach that combines passive management and with the application of silvicultural treatments designed to emulate gap dynamics, will promote compositional and structural diversity, and move succession forward to emulate later seral stage characteristics.

For forest birds, the ability to survive and breed is often related to the presence of specific forest structural conditions or attributes, such as those that provide nest sites, food and foraging substrates, singing perches, and cover from predators. While our management goals may create a relatively old forest, hardwood forests within White River will contain a variety of patches in different age classes and developmental stages; it is not uniform throughout. This diversity of age classes provides a variety of bird species with a range of nesting and foraging opportunities. Further, finer-scale investigation of forest conditions may identify opportunities to improve age class diversity through the creation of early-successional forests—a habitat in decline in portions of the watershed. Species dependent upon disturbances that create early successional forested habitats, like North Atlantic LCC (NALCC) representative species the chestnut-sided warbler and others, are declining as remaining patches of young forest mature (Sepik et al. 1994, Kelley et al. 2008). Across the CFA, enhanced horizontal

structure will provide foraging opportunities for bats, and support other species of conservation concern like ruffed grouse, black-throated blue warbler, American redstart, and black bear.

In a mature forest, many nesting bird species tend to remain within specific vegetation layers: on or near the ground, in the middle layer, or up in the canopy. White River's hardwood forests should have all forest layers present in moderate to high amounts distributed throughout a stand and across the landscape. Enhanced vertical structure will provide the greatest number of bird species with the greatest number of nesting and foraging opportunities. These habitat elements may have importance to declining mature forest-interior species identified in regional conservation plans like wood thrush. Wood thrush nest and feed at the ground level; a sub-canopy layer of shrubs, moist soils, and leaf litter are important habitat features (Roth et al. 1996, Rosenberg et al. 2003). And wood thrush has significance as a NALCC representative species for hardwood forests in the NALCC southern sub-region.

Our active forest management efforts will aim to create or maintain a canopy that is generally closed (greater than 75 to 80 percent closure) with small gap openings scattered throughout a stand and the CFA. These openings will be caused by or mimic small, single- to few-tree disturbances and create opportunities for regenerating intermediate- and shade-tolerant species. Regeneration in these openings will provide a continual supply of ephemeral nesting habitat for species like wood thrush. The distribution and concentration of these openings will vary, but interior forest conditions will be maintained on the whole. Close canopy conditions favor a suite of interior-nesting bird species that include: ovenbird, black-throated blue warbler, black-throated green warbler, and—when along rocky bottomed streams—Louisiana waterthrush.

Efforts to maintain or improve seral stage diversity within the CFA will include the retention of large-diameter (24 inches or greater in dbh) trees where appropriate. Such larger trees are either absent or are very few in younger forests, and that has implications for the habitat of wildlife species and for nutrient cycling. The White River CFA southern boundary is within 2 miles of the Bridgewater Mines, which were used by over a hundred hibernating little brown, tricolored, big brown and northern long-eared bat species (see sub-objective 1.2b for further discussion). These mines are no longer being used by bats due to decimation by white-nose syndrome. Little brown, northern long-eared, tricolored and eastern small-footed bats are undergoing review for listing under the ESA. Little brown bat and tricolored bat are currently being assessed for candidate status, while northern long-eared and eastern small-footed bat have been petitioned for listing under the ESA. Upon emergence from the hibernacula, females will travel to their summer range to give birth to pups in maternity colonies, while male bats often remain within 5 miles of the hibernaculum throughout the summer (Darling, unpublished). Crevices behind peeling bark of large diameter trees or cavities in partially decayed trees are used for maternity colonies and summer day roosts (Caceres and Pybus 1997). The habitats within the CFA may still provide current or future roosting, feeding and potential maternity sites. Structurally-sound, large-diameter trees are also important nest sites for woodland raptors, such as the red-shouldered hawk. Snags and cavity trees also provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the yellow-bellied sapsucker.

Implementation of refuge strategies will begin with a comprehensive, multi-scale forest and wildlife habitat inventory. Forest wildlife species survival and breeding success is dependent not only on the habitat at the stand level, but also the surrounding landscape, making it necessary to consider the proportions and sizes of stand types and successional stages within the CFA and the associated landscape. Baseline information on the condition of hardwood forests at the time of acquisition will further inform more detailed, stand-level habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Identify forest stands with late successional characteristics for passive management, and those where active management is necessary to improve forest structure. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.

- Identify sites appropriate for early successional management.

- Collaborate with partners within the Upper White River Cooperative Weed Management Association to strategically prevent and manage invasive plants.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

*Within 10 years of land acquisition and CCP approval:*

- Implement identified active forest management opportunities using accepted silvicultural practices. Appendix J provides general forest management guidelines, including descriptions of forestry techniques and explanations about how we will determine where and how to conduct active management.
- Retain and recruit 3 to 6 large (16 inch DBH) live or dead trees such as silver maple, beech, green ash, yellow birch and sugar maple per acre within a 5-mile radius of bat hibernacula as bat roosting sites.
- Create small canopy openings to improve solar exposure of existing or potential roost trees.
- Maintain contiguous late successional forest cover within 2 to 3 miles of rock cliffs and ledges to protect potential roosting sites of eastern small-footed bats.
- Protect hard and soft mast producing species such as American beech inclusions, and apple and cherry trees, through the use of best management practices.
- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Explore research opportunities with academic partners to address efficacy of forest management in meeting wildlife objectives.

**Inventory and Monitoring Strategies:**

*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Map vernal pools and seeps.
- Survey for and protect active maternity colonies and summer roost sites.

**Sub-objective 1.1b. (Biological Integrity, Biological Diversity, and Environmental Health)**

Where a focal species has not been identified, protect and restore habitats that contribute to the biological integrity, diversity, and environmental health of refuge lands and the Connecticut River watershed.

***Rationale:***

Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the White River CFA where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats are most often small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and providing additional structural and species diversity to the matrix. Rocky outcrops and upland meadows, for instance, are anomalies in an otherwise forested landscape. They often have a special flora and fauna—providing sunny, dry sites for reptiles to bask, or nectar producing flowers for foraging butterflies. One could make the case that these outcrops are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context. This approach will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually (e.g., imagine species conservation plans for particular insects or liverworts). Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Collaborate with partners within the Upper White River Cooperative Weed Management Association to strategically prevent and manage invasive plants.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Cliff and Talus)**
Protect cliffs, ledges and talus slopes to maintain the biological integrity, health and diversity of associated natural and rare ecological communities. Emphasis will be on sites occupied by nesting peregrine falcons and roosting bats.

***Rationale:***
Cliff and talus systems within this CFA occur below treeline at low to mid elevations. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places (Gawler 2008). The type of rock, microclimate, and soil availability from higher elevation sources directly and indirectly influence vegetation within these systems (Thompson and Sorenson 2000). Rock types may include limestone, dolmite, granite, schist, slate, or shale which breakdown differently in the environment providing varying levels of nutrients, moisture, ground stabilization, and soil availability. Sun exposure, aspect, elevation, and moisture provide different microclimate conditions impacting vegetation type and growth. These systems provide unique niches for rare and uncommon plants, and habitat for snakes, including the rare eastern timber rattlesnake, black rat snake, and eastern garter snake. Exposed cliffs provide nesting habitat for turkey vultures, ravens, porcupines, and peregrine falcons, a state species of greatest conservation need. Peregrine falcons are also a refuge purpose species. Vermont's breeding population has increased steadily since they were extirpated from the Eastern US in the mid to late 1960's due to indiscriminate use of DDT following World War II. Peregrines are nesting in White River CFA, and monitoring and management of Vermont's Peregrine population is being coordinated by Audubon Vermont.

Bats will use caves or mines within the cliff and talus systems for "hibernacula," where they hibernate, and rock crevices for summer roosting sites. This region hosted two bat hibernacula—two unused mines in Bridgewater. The Bridgewater mines were surveyed in the winter by the state between 2009 and 2013. Over a hundred bats were hibernating in each mine, including little brown bats, northern long-eared bats, tricolored bats, and big brown bats. These mines are no longer being used by bats due to decimation by white-nose syndrome. Although this hibernaculum is about a mile from the CFA boundary, and no longer used by bats at this time, the habitats within the CFA are still significant for roosting, feeding and for potential maternity sites (see sub-objective 1.1a for further discussion).

Management of cliff and talus systems in the White River CFA will begin with a comprehensive, multi-scale wildlife and habitat inventory. Wildlife species survival and breeding success is dependent on habitat at a fine scale and the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of cliff and talus systems at the time of acquisition will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Evaluate and manage human (e.g. recreational) influences, and conduct outreach and education as necessary.
- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct forest and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Identify historical, active, and potential peregrine falcon nesting sites.
- Coordinate with conservation organizations to conduct spring surveys of identified sites to determine occupancy.

- Work with partners to annually monitor active sites to determine occupancy status and reproductive outcome.

- Survey for and protect bat roosting sites.

**Sub-objective 1.2b. (Pasture/Hay/Grassland)**
Manage pasture, hay, and grasslands (where appropriate) for shrub-dependent conservation concern species such as chestnut-sided warbler.

***Rationale:***
Less than one percent of the White River CFA is typed as pasture, hay, and grassland habitat. These habitat types require active manipulation to inhibit the natural succession of converting to forest. The pasture, hay, and grassland habitats tend to be dominated by grasses. Depending on habitat patch size, continuity of patches and timing of manipulations, this habitat type will support grassland dependent species such as bobolink and grasshopper sparrow. If these habitats are left unmaintained (e.g. not mowed), they will convert to a mixture of shrubs and grasses providing "old field" habitat for shrub dependent species such as chestnut-sided warbler, prairie warbler and field sparrow.

Many shrubland bird breeding populations occur in high proportions in the northeast, and therefore, are species of conservation responsibility (Dettmers, Randy 2003). For example, over 12% of the chestnut-sided warbler population breeds in BCR 14 (Dettmers, Randy 2006). While there is evidence that southern New England supported a small but significant grassland bird community before European settlement, only a small proportion of grassland breeding bird populations occurs in the northeast (Dettmers and Rosenburg 2000). Maintaining high quality shrubland habitat in this CFA will provide habitat for a higher percentage of species in decline.

Shrubland dominated habitats in the northeast support many species of conservation concern, many of which are a high conservation responsibility for the region, indicating the importance of shrubland habitats to these species in the CFA. Current pasture, hay, and grassland acres can provide quality habitat for these species, if managed appropriately. In order to make an informed management decision, it will be necessary to conduct a comprehensive, multi-scale wildlife and habitat inventory. Baseline information on the condition of these habitats will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- Collaborate with partners within the Upper White River Cooperative Weed Management Association to strategically prevent and manage invasive plants.

- Work with partners to protect and promote farming practices (e.g. haying and pasture of animals) that benefit wildlife and protect water quality.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*
- As new pasture, hay, and/or grassland habitat is acquired, evaluate its ecological importance to determine if it should be maintained, managed as shrubland or restored to native forest through tree plantings or natural succession.

**Sub-objective 1.2c. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy

suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

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The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity, and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the CFA is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Collaborate with partners within the Upper White River Cooperative Weed Management Association to strategically prevent and manage invasive plants.

- Work with partners, including the State, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.

## Objective 1.3: Inland Aquatic Habitats

**Sub-objective 1.3a. (Open Water)**
In collaboration with partners, manage water resources and riparian areas to provide cold temperature regimes, substrate diversity, and clear aquatic species passage that benefit priority refuge resources of concern including Eastern brook trout and Atlantic salmon.

***Rationale:***
The White River is the longest free-flowing tributary to the Connecticut River, and is very important to Atlantic salmon restoration. The many brooks that flow into the White River, such as Fletcher Brook, Stony Brook, Taggart Brook, Broughton Brook, and Boutwell Brook, provide high quality cold water habitat for brook trout and Atlantic salmon. Brook trout and Atlantic salmon are sensitive to extreme temperature fluctuations, and require water temperatures between 40-70 degrees Fahrenheit for spawning, growth, and survival. Brook trout and salmon are a high priority for conservation by the State and the Service's Northeast Region. Other species that occur in the White River CFA include creek chub, white sucker, slimy sculpin, and blacknose dace.

Management of water resources in the White River CFA will focus on providing rivers and streams that provide clear aquatic species passage to spawning and wintering habitat and structurally diverse in-stream habitat. Due to our lack of knowledge regarding habitat conditions in the CFA, implementation of refuge strategies will begin with a comprehensive, multi-scale wildlife and habitat inventory. Aquatic species survival and breeding success is dependent on not only on the habitat at a fine scale, but also the surrounding landscape, making it necessary to look at the adjacent forest conditions and land uses within the CFA and associated landscape. Baseline information on the condition of open water habitat will further inform more detailed habitat prescriptions within a required step-down Habitat Management Plan.

**Management Strategies:**
*Within 10 years of land acquisition and CCP approval:*

- Work with partners to implement a remediation plan for identified obstacles to aquatic species passage.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with partners to conduct stream assessments to evaluate the physical, chemical, and biological condition of the fish community structure, productivity, and health.
- Work with partners to conduct stream assessments to identify man-made physical barriers (e.g. impassable road crossings, culverts, and dams) to the movement of fish and other aquatic organisms.
- Collaborate with partners within the Upper White River Cooperative Weed Management Association to strategically prevent and manage invasive plants.

## Objective 1.4: Coastal Non-forested Uplands (coastal beaches and rocky shores)

*Not applicable*

## Objective 1.5: Coastal Wetlands and Aquatic Habitats (tidal salt marsh and estuary)

*Not applicable*

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the White River Division as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education. Environmental education is an important tool that can help refuge visitors and local residents, particularly students, appreciate the importance of this area to the larger watershed.

Because this division will be unstaffed, the majority of environmental education opportunities on this division will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*
- Encourage schools, scout groups, and summer camps to develop curricula that use the White River Division as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the White River Division as an outdoor classroom.

***Rationale:***
See rationale for sub-objective 2.1a.

**Management Strategies:**
*Within 1 year of acquiring sufficient land:*
- Encourage schools, scout groups, and summer camps to develop curricula that use the White River Division as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the White River Division. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. Interpretation is an important tool that can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With an ADA compliant trail planned for the site, the White River Division will be well suited to support both self-guided, wildlife dependent interpretive experiences, as well as guided interpretive programs that convey messages about the refuge and about the White River Division's habitats and cultural resources.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the White River Division.
- Provide resources and trainings to Friends, and volunteers in support of interpretive programs.

*Within 10 years of acquiring sufficient land:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, and printed media.
- Employ a variety of themed interpretive offerings (e.g., presentations, audio-visual programs, brochures, and exhibits) when creating programming for natural and cultural resource interpretation.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 5 years of acquiring sufficient land:*

- Through partners, and Friends group, annually provide quality interpretive programs, exhibits, printed media at the White River Division.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, e.g., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of acquiring sufficient land:*

- Contribute refuge interpretive information for scenic byways and other state publications and signs.
- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the White River Division would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the White River Division would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below.

***Rationale:***
The White River CFA is a popular area to hunt white-tailed deer, Eastern wild turkey, black bear, and small game. Hunting would be allowed on a newly created division as long as it is found to be a compatible use. Hunting, if found to be a compatible use, will be allowed when the Service acquires land that can support hunt seasons. Retaining hunting opportunities on public lands will ensure this wildlife-dependent recreational activity continues and contribute to the state's population management objectives.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Complete all administrative requirements to officially open to hunting consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk in a conspicuous location to post information on hunting seasons and other notices to visitors.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Vermont Fish and Wildlife Department to determine whether opportunities exist for State-recognized disabled hunters.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Work with Vermont Fish and Wildlife Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide hunter education classes access to the division and conduct directed outreach to ensure hunters are informed about regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, website pages, media releases, etc. to increase interest in hunting at the division.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the division with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land to support hunting seasons:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge Web site, at White River Division kiosks, through a friends group, and in local businesses.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of acquiring sufficient land to support hunting seasons:*

- Work with Vermont Fish and Wildlife Department to encourage youth hunting at the division as a means of introducing young people to this traditional recreation activity.
- Offer to host hunter education field courses.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

**Sub-objective 3.2a. (Fishing Opportunities, Access and Infrastructure)**
Provide quality fishing opportunities at the White River Division after completing all administrative procedures to officially open refuge lands to fishing, based on Vermont Fish and Wildlife Department regulations, and any division-specific conditions.

***Rationale:***
There are many fishable streams in the proposed CFA including the White River, Boutwell Brook, Broughton Brook, Dalton Brook, Little Stony Brook, Davis Hill Brook, Perkins Brook, Johnson Brook, Taggart Brook, Fletcher Brook, Windfall Brook, Basin Brook, Mink Brook, Quimby Brook, and Taylor Brook. The White River from Stockbridge to Bethel represents exceptional fishing opportunities for rainbow trout, brown trout, smallmouth bass, and walleye. Johnson and Fletcher Brooks possess quality fishing opportunities for wild rainbow and brook trout. A variety of game fish are found in the other streams of the CFA. Fishing is a popular activity throughout this area and would continue under Service ownership. Retaining fishing opportunities conforms to historic use on CFA and much of the surrounding land in the area.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Complete all administrative requirements to officially open to fishing consistent with State hunting regulations and, if necessary, additional refuge-specific regulations.
- Post newly acquired properties to ensure refuge boundary lines are clearly marked.
- Install an informational kiosk to post information on fishing seasons and other notices to visitors.
- The White River Division would be open daily to all visitors, including anglers, from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters.

*Within 5 years of acquiring land with fishable waters:*

- Work with the Vermont Fish and Wildlife Department to inventory and assess fish populations on the division.
- Work with the Vermont Fish and Wildlife Department to evaluate potential fishing enhancements, especially to the White River, Little Stony Brook, Johnson Brook, and Fletcher Brook.

**Inventory and Monitoring Strategies:**
*Within 5 years of land acquisition and CCP approval:*

- Develop a system to monitor and evaluate the fishing program with anglers and other users to determine the objective is being met and to allow for adaptive management.

**Sub-objective 3.2b. (Angler Education and Outreach)**
Develop programs, including brochures, signage, website pages, media releases, etc. to inform visitors of fishing opportunities at the division.

***Rationale:***
Fishing is a priority public use and a traditional use in the CFA. If land is acquired, the refuge will make information readily available to interested anglers regarding opportunities to fish on Service-owned land, location of fishable waters, and the available game fish.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land with fishable waters:*

- Produce a fishing brochure that includes information on regulations, angler ethics, safety considerations, etc. and make it available on the refuge website, at informational kiosks, and in local businesses. In all materials related to the fishing program, promote use of lead-free tackle.

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography for people of all physical abilities.

***Rationale:***
Wildlife viewing and photography are priority public uses on national wildlife refuges and a popular recreational activity. Local organizations such as Vermont Audubon chapters and others offer organized field trips to popular natural areas. A new division in this area would offer people the chance to see and photograph wildlife and in their native habitats, while learning more about the Service, Refuge System, and the refuge.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring land:*

- Allow public access from 30 minutes before sunrise to 30 minutes after sunset with the exception listed for hunters and anglers.

- Install an informational kiosk in a conspicuous location to post information on wildlife observation and photography opportunities, and other notices to visitors.

*Within 5 years of acquiring sufficient land:*

- Develop a public access strategy and required planning (i.e., NEPA, compatibility determination) that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

*Within 15 years of acquiring sufficient land:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with a friends group and other partners that host events designed to view wildlife on the division.

***Rationale:***
The entire division would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow photography blinds that do not negatively impact wildlife behavior or conflict with other visitors. Blinds must be removed each day, unless arrangements have been made via a special use permit.

*Within 5 years of acquiring sufficient land:*

- Develop interpretive panels for kiosks and trails that describe typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups such as a local chapter of Vermont Audubon and other environmental organizations to offer wildlife-centered trips to the refuge.
- Produce a list of wildlife species and associated habitats and other conservation information on the division for distribution at informational kiosks, the refuge website, and other popular media.

*Within 10 years of acquiring sufficient land:*

- Develop a public access strategy and required NEPA documentation that includes consideration of developed trails, parking, kiosks, viewing platforms, blinds, interpretation, signage, etc.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the White River Division that support regional water-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Regional water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as fishing, boating, and wildlife observation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any water trails (e.g., canoe/kayak trails) that part of a regional or State network for their compatibility.

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
Develop compatible opportunities on the White River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
Land water-based trails give individuals opportunities to engage in outdoor recreational opportunities in the Connecticut River watershed, such as hiking, wildlife observation, and interpretation. Where appropriate, we will work with these partners to promote, and distribute information about, these opportunities.

**Management Strategies:**
*Within 5 years of acquiring land:*

- As lands are acquired, evaluate any existing trails (e.g., hiking trails, snowmobile trails, horseback riding trails) that part of an established regional or State network to determine if they are appropriate and compatible uses for the refuge.

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Develop compatible opportunities on the White River Division that support regional land-based trail initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the division without detrimentally impacting the wildlife resource.

**Management Strategies:**
(These strategies are dependent on land acquisition from willing landowners.)

*Within 1 year of acquiring sufficient land:*

- Allow dispersed hiking, snowshoeing, and cross-country skiing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Work with users to delineate winter cross-country skiing trails and determine whether a special use permit to manage winter trails is warranted.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of acquiring sufficient land:*

- Work with Friends groups and partners to design and market a virtual geocache course at the division. The course should integrate orienteering with refuge interpretive messages that include linking this division to other refuge divisions and units.

# Overview
# Putney Mountain Unit (Existing Refuge Unit)

## Brookline and Putney, Vermont

| Total Unit Acres[1] | 285 |
|---|---|

[1]Acres from Service's Realty program (surveyed acres)

## Summary

### What are the priority habitat types within the unit?

- Hardwood forest - 99.5%

See map A.69 and table A.51 for more detailed habitat information about the unit.

### What are the Federal trust and other natural resource values in the unit?

1. **Endangered Species**
   The wetlands of the Putney Mountain Unit are home to a population of northeastern bulrush, a federally endangered wetland plant known to colonize areas with variable water levels. In the case of Putney Mountain, the population occurs along the periphery of beaver-influenced wetlands.

2. **Migratory Birds**
   The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The forests in the Putney Mountain Unit are important stopover habitat for landbirds.

3. **Wetlands**
   The beaver-influenced wetlands at Putney Mountain create habitat conditions necessary for the federally endangered northeastern bulrush to persist.

### What habitat management activities would likely be a priority on refuge lands within this unit?

We will conduct a comprehensive, multi-scale wildlife habitat inventory. Baseline information on the condition of habitats (e.g., forested, non-forested and open water habitats) will further inform more detailed, habitat prescriptions within a required step-down habitat management plan (HMP). Once inventory has been completed, then management will focus on the following:

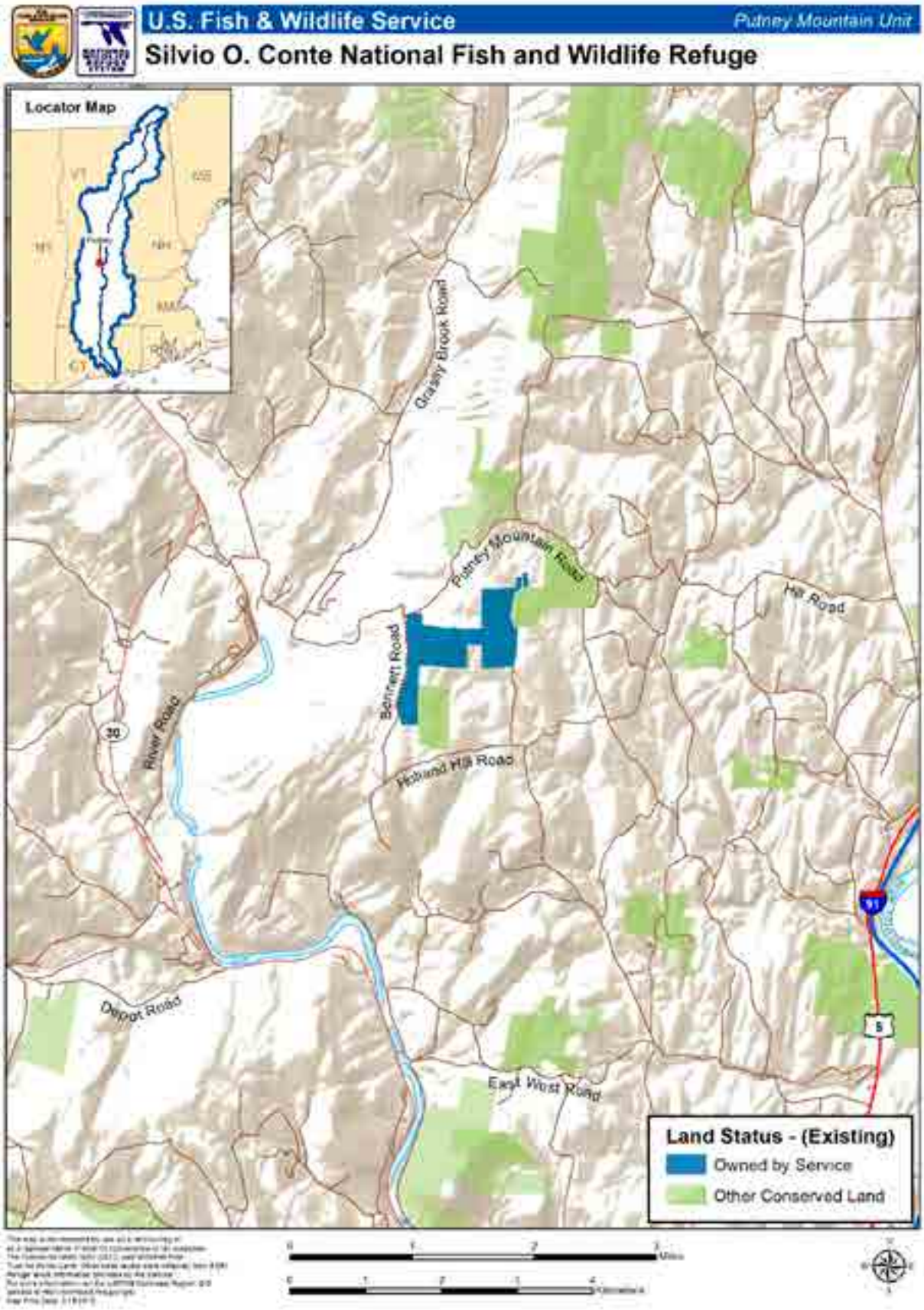
- Manage freshwater marsh habitats to support the northeastern bulrush.
- Manage invasive plants to maintain native diversity.

### What public use opportunities would likely be a priority on refuge lands within the unit?

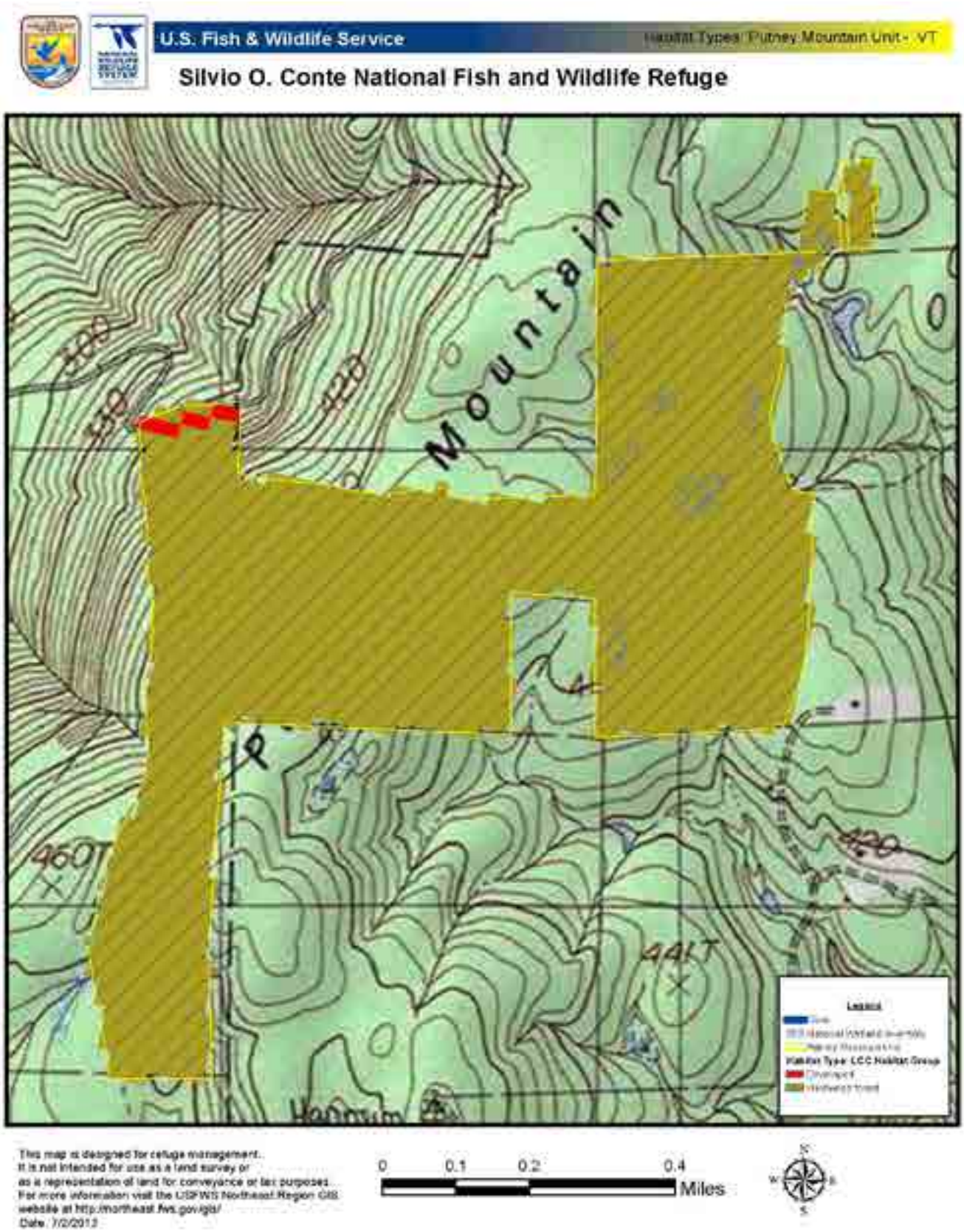
The National Wildlife Refuge System Improvement Act of 1997 identified hunting, fishing, wildlife observation, photography, interpretation, and environmental education as priority, wildlife-dependent uses. As such, these uses would receive priority on refuge lands.

We propose to construct additional trails to enhance public use opportunities on the unit. See map A.70 for the proposed public use trails and other infrastructure for the unit.

*Map A.68. Putney Mountain Unit – Location.*



*Map A.69. Putney Mountain Unit – Habitat Types.*



*Map A.70. Putney Mountain Unit – Existing and Proposed Public Use Facilities.*

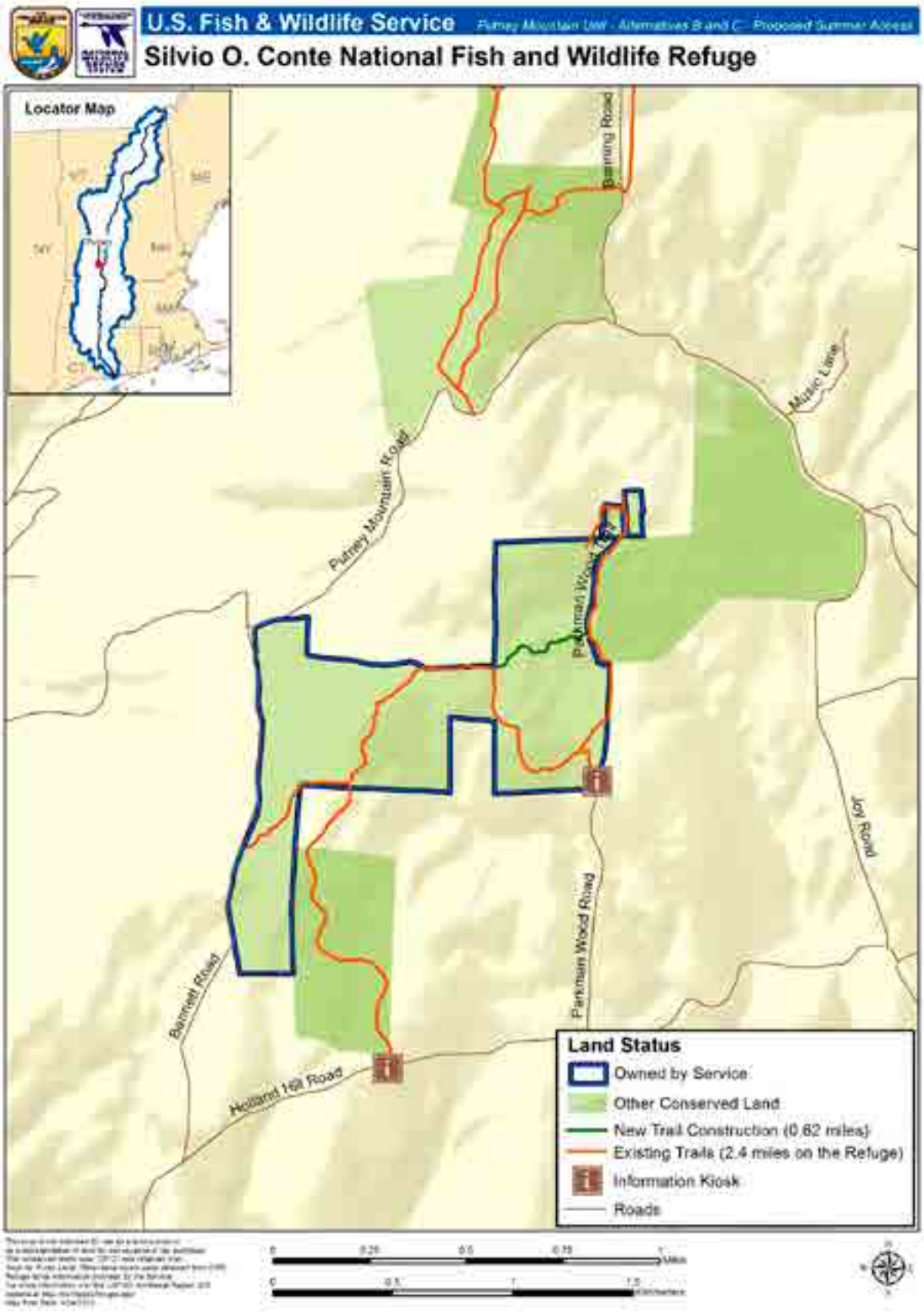


**Table A.51. Putney Mountain Unit – Habitat Types.**

| LCC General Habitat Type[1] | Unit | |
|---|---|---|
| | Total Acres | Percent Unit |
| **Forested Uplands and Wetlands[2]** | | |
| Hardwood forest | 282 | 99.5% |
| *Forested uplands and wetlands subtotal* | *282* | *99.5%* |
| **Other** | | |
| Developed | 2 | 0.5% |
| *Other subtotal* | *2* | *0.5%* |
| **TOTAL** | **284** | **100.0%** |

**All acreages are based upon GIS analysis and should be considered estimates

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS). See table A.52 at the end of this appendix for a comparison of these generalized habitat types with the more specific The Nature Conservancy's Northeastern Terrestrial Habitat Classification System. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

2 - CCP Objective from Silvio O. Conte NFWR Draft CCP/EIS, Chapter 4, Alternative C-Service's Preferred Alternative

# Goals, Objectives, and Strategies for the Putney Mountain Unit under Alternative C

**Goal 1: Wildlife and Habitat Conservation:** Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function and supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

## Objective 1.1: Forested Uplands and Wetlands

**Sub-objective 1.1b. (Biological Integrity, Biological Diversity, and Environmental Health)**
Where and when appropriate, protect, or restore habitats absent an identified species of conservation concern, recognizing the importance of all habitats in contributing to the biological integrity, diversity, and environmental health of refuge lands and the Watershed.

***Rationale:***
Achieving the refuge purposes and the Refuge System mission are the paramount considerations for refuge management. Additionally, the Service has policy for maintaining and restoring, where appropriate, refuges' "biological integrity, diversity, and environmental health" (601 FW 3). This policy provides refuge managers with a process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, restore lost or severely degraded components. The policy suggests using historic conditions as a reference for comparing the ecosystem's current composition, structure, and functioning to what it was prior to substantial human related changes to the landscape. This comparison can be used to direct management to maintain or restore those natural conditions, to the extent practicable, without jeopardizing refuge purposes. For example, we consider the natural timing and frequency of disturbances, such as fires and flooding, and mimic those processes. In other words, the policy is intended to induce management for native fish, wildlife, and plants and their habitats in natural conditions, and with natural processes, using historic conditions to help identify such conditions and processes (Paveglio et al. 2010). However, we recognize that it is not always possible or desirable to try to mimic historic conditions, particularly in the face of predicted climate and land use changes and other landscape-scale considerations. Historic conditions are only one of many considerations when making decisions about how to manage refuge resources.

Conservationists often use the metaphor of coarse filters and fine filters to convey two complementary strategies for maintaining biological diversity, biological integrity, and environmental health: the first focuses on conserving ecosystems and the second focuses on species (Noss 1987, Hunter 1991, Groves 2003). The coarse-filter approach seeks to protect a representative array of natural ecosystems and their constituent processes, structures, and species (the refuge); however, some species fall through its pores, and coarse filters must be complemented by fine filter strategies tailored to fit particular species (priority species of concern). Sub-objectives throughout this plan generally represent a fine-filter approach—identifying species and their habitats that the USFWS has identified as priorities based upon our establishing legislation, refuge system mission, regional and national conservation plans, and conversations with conservation partners. In contrast, this sub-objective outlines CFA management that will benefit many of its species, the majority of which will not receive the special, tailored attention of fine-filter conservation. The BIDEH policy guidance complements coarse-filter conservation in ways that fine-filter conservation misses.

The key idea of BIDEH conservation is that most ecosystems contain certain features that are critical to the welfare of many species; thus, conserving those features can have a positive effect on a large suite of species (biological diversity). Logs in a forest, hedgerows in an agricultural landscape, and streams and pools in many terrestrial ecosystems are all examples of ecosystem features that support far more species than one would predict based on their size alone. The importance of conserving these features is widely recognized, but in an ad hoc, idiosyncratic fashion that often does not recognize the commonality between maintaining a hedgerow, a rock outcrop, and an herbaceous wetland. BIDEH conservation overlaps with many aspects of matrix management and ecosystem management (Lindenmayer and Franklin 2002). A key difference is its specific focus on ecosystem elements, which explicitly complements coarse-filter and fine-filter conservation.

Habitats that occur within the Putney Mountain Unit where species-specific management guidelines are not identified will be managed under the umbrella BIDEH policy. These habitats, by virtue of refuge land ownership, represent small or isolated occurrences, but are important in maintaining connectivity within the larger forested matrix, and provide additional structural and species diversity to the matrix. A rich wetland environment or a rock outcrop, for instance, is an anomaly in an otherwise forested landscape. They often have a special flora and fauna—beaver influenced water depths that create habitat for particular plants, or rhyolite bedrock that support rare lichen. One could make the case that these beaver-influenced wetlands are small, independent ecosystems, but they are really too small to be candidates for a classic coarse-filter strategy and thus best considered in a BIDEH context.

Some habitats within the unit will be managed under a more classic coarse-filter approach—primarily those areas where the federally listed northeastern bulrush has been documented. USFWS policy requires species-specific management efforts in the case of rare, threatened, or endangered species. New trail development on the unit has the potential to negatively impact bulrush populations. Refuge staff will continue to monitor the known bulrush populations (see sub-objective 1.2a).

Combining coarse and fine-scale conservation efforts under the rubric of BIDEH will allow the conservation of large numbers of species, the majority of which are too poorly known to be conserved individually, and more targeted strategies for those rare, threatened, or endangered species like the northeastern bulrush. Together, the multiple strategies are reasonably comprehensive because all species and habitats known to be in jeopardy will receive needed attention.

The negative consequences of habitat loss and fragmentation to aspects of biological integrity, diversity and health have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig 2003). Our understanding of the current condition of all the habitats considered under this sub-objective and their contribution to the BIDEH of the Unit is poor. A comprehensive forest and wildlife habitat inventory will be necessary to inform more detailed management strategies that provide the full range of natural processes.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Ensure a diversity of native species is present and non-native species are excluded or managed to keep population levels as low as possible.
- Control invasive species, with priority given to carefully controlling reed canary grass and glossy buckthorn.
- Work with partners, including the State of Vermont, in support of the State Wildlife Action Plan, to ensure management on Service lands complement adjacent land management objectives.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Conduct habitat and wildlife inventories.
- Map natural communities; protect rare or exemplary examples.
- Monitor impacts to sensitive habitats from the introduction of trail users.
- Monitor known northeastern bulrush populations.

## Objective 1.2: Non-forested Uplands and Wetlands

**Sub-objective 1.2a. (Freshwater Marsh)**
Manage freshwater marshes to support the federally listed northeastern bulrush, and wetland associated natural and rare ecological communities.

***Rationale:***
Freshwater marshes are often dominated by emergent and submergent herbaceous vegetation. Scattered shrubs are often present, and trees are generally absent. Herbaceous vegetation typically includes common bulrush, jewelweed, marsh fern, water lily, and narrow-leaved cattail. This habitat is associated with lakes, ponds, impoundments, and slow-moving rivers and streams (Gawler 2008). These marshes are also maintained over time by beaver activity, an important natural disturbance process within the Putney Mountain Unit.

The northeastern bulrush, a wetland plant, occurs in isolated small wetlands within the unit. This species is federally listed, and has adapted to seasonal water fluctuations. Habitat alterations that change the hydrology of a wetland to be consistently wet or dry may have negative consequences for this species. Biologists are currently monitoring known populations, but more information is needed on the habitat requirements, reproductive strategy, and genetic variability (U.S. Fish and Wildlife Service 2006). Research, and preventing habitat destruction and deterioration of wetland sites where this plant is found are crucial steps to maintaining this northeastern bulrush population.

Implementation of refuge strategies will begin with a comprehensive, multi-scale habitat inventory. Plant surveys of freshwater marsh habitats will inventory all species present, but will focus on northeastern bulrush occurrences. This baseline information will further inform more detailed habitat prescriptions within a required step-down HMP.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Minimize refuge activities that disturb wetland communities.
- Carefully control reed canary grass and glossy buckthorn, which are beginning to invade northern bulrush habitat.
- Explore and support research opportunities with academic partners to address information gaps for northeastern bulrush.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Inventory wetland plant communities, and evaluate wetland hydrology for potential impacts to the natural flow regimes.
- Survey wildlife use of existing wetlands.
- Map natural communities; protect rare or exemplary examples.
- Work with the State Natural Heritage Program to annually monitor the presence/absence of current northeastern bulrush populations in emergent wetlands.

**Goal 2: Education, Interpretation, and Outreach:** Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River watershed, and promote a greater understanding and appreciation of the role of the refuge in conserving those resources.

## Objective 2.1: Environmental Education

In collaboration with public and private educators from all four states in the watershed, lead or facilitate the implementation of structured natural and cultural resource curricula, with a focus on guiding educators and students to develop an awareness of, and concern about, natural and cultural resources and associated challenges; appreciate our conservation history; make informed decisions and work individually or collectively toward solutions; and model responsible environmental stewardship in their everyday lives.

**Sub-objective 2.1a. (Environmental Education Planning and Training)**
Encourage schools, scout groups, and summer camps to develop curricula that use the Putney Mountain Unit as an outdoor classroom.

***Rationale:***
See environmental education rationale in chapter 4 detailing the importance of environmental education for the Service. Environmental education is one of the six priority, wildlife-dependent recreational uses of the Refuge System. Environmental education is particularly important at Conte Refuge because one of its founding purposes is to provide opportunities for environmental education.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to develop curricula that use the Putney Mountain Unit as an outdoor classroom.

**Sub-objective 2.1b. (Environmental Education Delivery)**
Encourage schools, scout groups, and summer camps to use the Putney Mountain Unit as an outdoor classroom.

***Rationale:***
Because this unit will be unstaffed, the majority of environmental education opportunities on this unit will be led by partners, volunteers, and local school groups and other educational groups (e.g., scout groups and summer camps).

**Management Strategies:**
*Within 1 year of CCP approval:*

- Encourage schools, scout groups, and summer camps to use the Putney Mountain Unit as an outdoor classroom.

## Objective 2.2: Interpretation

Develop, lead, and facilitate interpretive programs that emotionally and intellectually connect the audience to natural and cultural resources in the watershed.

**Sub-objective 2.2a. (Natural and Cultural Resource Interpretive Planning and Training)**
With Friends groups, public and non-profit organizations, and volunteers, offer quality interpretive programming at the Putney Mountain Unit. The development of highly trained interpreters will be encouraged by offering interpretive training to Friends' members, partners, and volunteers on a regular basis.

***Rationale:***
See the rationale in chapter 4 detailing the importance of interpretation for the Service. At the Putney Mount Unit interpretation can help refuge visitors and local residents appreciate the importance of this area to the larger watershed. With several trails and a kiosk, the unit is primarily a place for self-guided, wildlife dependent interpretive experiences. Other groups, such as the Putney Mountain Association, my also occasionally present interpretive programs that convey messages about the refuge and about the Putney Mountain Unit's habitats and cultural resources.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Inventory and evaluate each CFA to determine the appropriate interpretive materials to employ.
- Create meaningful, consistent, thematic statements to be used in the delivery of programming at the Putney Mountain Unit.
- Provide resources and trainings to Friends and volunteers in support of interpretive programs.

*Within 10 years of CCP approval:*

- Develop standardized self-guided interpretive services, such as interpretive trails and kiosks, exhibits, and printed media.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Build an evaluation process that includes formal and informal evaluation to assess the effectiveness of all interpretation programs.

**Sub-objective 2.2b. (Natural and Cultural Resource Interpretive Program Delivery)**
Collaborate with Friends group, partners, and volunteers to deliver quality natural and cultural resource interpretive programs.

***Rationale:***
See rationale for sub-objective 2.2a.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Through partners, and Friends group, annually provide quality interpretive programs and printed media at the Putney Mountain Unit.
- Incorporate thematic statements, measureable objectives, and evaluation measures into all interpretation efforts.
- Publicize interpretive programs through traditional media, on the refuge web site, and digital social media conduits.
- Maintain a supply of print interpretive brochures, i.e., general brochure and bird checklist that incorporate refuge interpretive messages and themes.
- Work with partners to create issue-oriented experiential activities and programs for use at their facilities.

*Within 10 years of CCP approval:*

- Develop self -guided interpretive messages and use state of the art as well as traditional media (e.g., brochures).

## Objective 2.3: Public and Community Outreach

Support, promote, and coordinate a wide range of outreach tools and activities to facilitate and improve communications and relationships with the American public, especially communities, adjacent landowners, and elected officials in the Connecticut River watershed, and to empower citizens to recognize and resolve local natural resource issues and promote conservation and the responsible use of natural resources.

*Because the Putney Mountain Unit would be unstaffed and does not have refuge facilities, public and community outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

## Objective 2.4: Science and Technical Outreach

Facilitate the collection and exchange of information that increases the knowledge and understanding of natural and cultural resources, addresses climate change and other conservation issues, and provides land managers with better information to make management decisions affecting resources.

*Because the Putney Mountain Unit would be unstaffed and does not have refuge facilities, science and technical outreach for this site will occur through regular outreach activities at the headquarters and will not specifically occur at this site.*

**Goal 3: Recreation:** Promote high-quality, public recreational opportunities in the Connecticut River watershed that are complementary between ownerships and which provide regional linkages with emphasis on promoting wildlife-dependent activities that connect people with nature.

## Objective 3.1: Hunting

Support quality public hunting opportunities in the Connecticut River watershed to promote a unique understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in America's natural heritage and conservation history.

**Sub-objective 3.1a. (Hunting Opportunity, Access, and Infrastructure)**
Provide the opportunity for a quality hunting experience following state regulations, except as noted under Strategies below.

***Rationale:***
Hunting is allowed on national wildlife refuges, as long as it is found to be a compatible use. Because of its array of habitats, the unit is a desirable location for hunting white-tailed deer, wild turkey, and small game species. This area and the surrounding lands have been used for hunting for many years.

**Management Strategies:**
*Continue to:*

- Allow hunting based on regulations which correspond to the State of Vermont regulations with the following exceptions:

  (a) The building or use of permanent tree stands or ground blinds is prohibited.

  (b) Temporary blinds are permitted, but must have the owner's name and address visible on the blind and the blind must be removed at the end of the hunting season.

  (c) The use or possession of alcoholic beverages while hunting is prohibited.

- Allow hunters access to the refuge outside of the normal division open hours (i.e. 30 minutes before sunrise and 30 minutes after sunset) as long as they are engaged in lawful hunting activities.

*Within 1 year of CCP approval:*

- Retain current unit hunting regulations which correspond to the State of Vermont regulations with the following exceptions:

  (a) Retrieving dogs must be under voice command at all times.

  (b) Nighttime raccoon hunting with dogs requires a special use permit.

- Request that the VFWD promote hunting by featuring refuge opportunities in their annual hunting and fishing digest; also use the digest to describe any refuge-specific regulations.

*Within 5 years of CCP approval:*

- Work with the Vermont Fish and Wildlife Department to determine whether opportunities exist for State-recognized disabled hunters, and if so, identify potentially new infrastructure.

**Inventory and Monitoring Strategies:**
*Within 5 years of CCP approval:*

- Work with Vermont Fish and Wildlife Department to evaluate the effectiveness and success of the refuge hunt program in contributing to state population objectives.

**Sub-objective 3.1b. (Hunter Education and Outreach)**
Provide state-sponsored hunter education classes access to the unit. Conduct directed outreach to ensure hunters are informed about refuge-specific regulations, hunter ethics, and safety considerations. Develop programs, including brochures, signage, web pages, media releases, etc.

***Rationale:***
Hunting is a priority public use that also serves as a population management tool. Providing hunter education instructors the opportunity to use the unit with their classes will strengthen connections to the hunting community and student understanding of the role hunting plays in wildlife management. Making relevant information readily available to hunters through a variety of media will improve the quality of the hunting experience. The unit's visitor contact station and its surrounding grounds provide an ideal setting for this type of instruction. In addition, the meeting space and grounds can also be used for onsite archery programs, directed by volunteers, with staff support.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Produce a hunt brochure that includes a hunt map and information on regulations, hunter ethics, safety considerations, etc. and make it available on the refuge website and at Putney Mountain Unit informational kiosks.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure. In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

*Within 5 years of CCP approval:*

- Develop a system to monitor and evaluate the hunting program with hunters and other users to determine if the objective is being met and to allow for adaptive management.

## Objective 3.2: Fishing

Support quality, public fishing opportunities in the Connecticut River watershed to promote an understanding and appreciation of natural resources and their management on lands and waters, while also protecting a traditional outdoor pastime deeply rooted in the America's natural heritage and conservation history.

*This objective is not applicable because the Putney Mountain Unit does not have any waterbodies suitable for fishing.*

## Objective 3.3: Wildlife Observation and Photography

Support quality, public opportunities to observe and photograph wildlife in the Connecticut River watershed in a variety of natural habitats to connect a broad spectrum of people with nature.

**Sub-objective 3.3a. (Infrastructure and Access for Wildlife Observation and Photography)**
Provide quality opportunities for wildlife observation and photography at the Putney Mountain Unit.

***Rationale:***
Wildlife viewing and photography is a priority public use on national wildlife refuges and a popular recreational activity in this area, in particular during the fall hawk migration. Currently, infrastructure is limited to several informal hiking trails that bisect the unit and connect to a larger network of conserved lands. Fostering wildlife observation and photography is in keeping with the other conservation landowners along the Putney Mountain ridgeline.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow wildlife observation and photography at the Putney Mountain Unit.
- Allow public access for uses other than hunting, at the unit daily from 30 minutes before sunrise to 30 minutes after sunset.
- Add information on the unit to the refuge website.
- Work with the Putney Mountain Association to install informational kiosk(s) on refuge and/or partner lands in order to orient visitors and provide information about the general area.

*Within 5 years of CCP approval:*

- Work within the Putney Mountain Association, Windmill Ridge Association, and other partners to develop a public access strategy that responds to the demand for access across all ownerships, provides safe trailhead parking, a well-defined trail network, informational kiosk(s), etc.

*Within 10 years of CCP approval:*

- Implement the visitor use enhancements identified in the public access strategy and the refuge Visitor Services Plan.

**Sub-objective 3.3b. (Wildlife Observation and Photography Aids)**
Offer viewing and photography aids that enhance the visitor experience. Use a variety of methods to reach a broad spectrum of people. Work closely with the friends group and other partners who host events designed to view wildlife on the unit.

***Rationale:***
The entire unit would be available for wildlife observation and photography; however, there are steps the refuge can take to enhance the visitor experience. By providing new visitors a quality experience they are more likely to return and share their experiences with others. One way to accomplish this is to offer sufficient information to attract a variety of visitors through a variety of media.

**Management Strategies:**
*Within 5 years of CCP approval:*

- Develop interpretive panels describing typical wildlife on the refuge, bird migration patterns, and other messages we want to convey to visitors.
- Sponsor wildlife observation events such as International Migratory Bird Day, the Big Sit, etc.
- Encourage local schools and groups and environmental organizations to offer wildlife-centered trips to the unit.
- Produce a list of wildlife species and associated habitats, optimum viewing times and locations, and other conservation information on the unit for distribution at informational kiosks, the refuge website, and other popular media.

**Sub-objective 3.3c. (Watershed-based Partner Initiatives)**
*Not applicable*

## Objective 3.4: Other Recreational Activities

In order to reach a broader demographic, support non-priority outdoor recreational opportunities and public access to quality, nature-based experiences throughout the Connecticut River watershed that facilitate and improve community relationships, raise awareness and an appreciation for conserving natural resources, and garner support for the National Wildlife Refuge System.

**Sub-objective 3.4a. (Regional Water-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4b. (Regional Land-based Trail Initiatives and Opportunities Including Refuge Lands)**
*Not applicable*

**Sub-objective 3.4c. (Other Appropriate and Compatible Recreational Opportunities That Enhance Visitor Use and Enjoyment of Refuge Lands)**
Develop compatible opportunities on the Putney Mountain Unit that support initiatives to connect people with nature, raise the visibility of the Service and the Refuge System, make the refuge more relevant to the local community, and to promote economic activity in the local area.

***Rationale:***
In addition to the priority public uses, there are other wildlife-dependent, appropriate and compatible recreational activities that can broaden the visitor base, giving people alternative ways to enjoy the natural resources at the unit without detrimentally impacting the wildlife resource.

**Management Strategies:**
*Within 1 year of CCP approval:*

- Allow dispersed hiking and snowshoeing.
- Allow pet walking. In order to minimize conflicts with wildlife and other visitors, pets must be on leashes not longer than 10 feet in length.
- Allow recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds.
- When compatible, allow commercial guiding in support of priority public uses by special use permit.

*Within 5 years of CCP approval:*

- Work with partners to determine whether a virtual geocache course at the unit is acceptable on the conserved property. The course should integrate orienteering with refuge interpretive messages that include linking this unit to other refuge divisions and units.

Table A.52

James Weliver/USFWS

*Canada lynx kittens*

# Table A.52. Comparison of North Atlantic Landscape Conservation Cooperative (LCC)'s General Habitat Types and The Nature Conservancy's Northeastern Terrestrial Habitat Classification

- **Comparison of North Atlantic Landscape Conservation Cooperative (LCC)'s General Habitat Types and The Nature Conservancy's Northeastern Terrestrial Habitat Classification**

**Table A.52. Comparison of North Atlantic Landscape Conservation Cooperative (LCC)'s General Habitat Types and The Nature Conservancy's Northeastern Terrestrial Habitat Classification**

| North Atlantic LCC General Habitat Type[1] | The Nature Conservancy's Northeastern Terrestrial Habitat Classification[2] | CES Code[3] |
|---|---|---|
| **Forested Uplands and Wetlands** | | |
| Conifer swamp/Spruce-fir | Acadian sub-boreal spruce flat | 201.562 |
| | Laurentian-Acadian conifer-hardwood acidic swamp: bigger river floodplain | 201.574 |
| | Laurentian-Acadian conifer-hardwood acidic swamp: isolated | 201.574 |
| | Laurentian-Acadian conifer-hardwood acidic swamp: pond/lake | 201.574 |
| | Laurentian-Acadian conifer-hardwood acidic swamp: stream/river riparian | 201.574 |
| | Laurentian-Acadian alkaline conifer-hardwood swamp: bigger river floodplain | 201.575 |
| | Laurentian-Acadian alkaline conifer-hardwood swamp: isolated | 201.575 |
| | Laurentian-Acadian alkaline conifer-hardwood swamp: pond/lake | 201.575 |
| | Laurentian-Acadian alkaline conifer-hardwood swamp: stream/river riparian | 201.575 |
| | Acadian low elevation spruce-fir-hardwood forest | 201.565 |
| | Acadian-Appalachian montane spruce-fir-hardwood forest | 201.566 |
| Hardwood forest | Appalachian (hemlock)-northern hardwood forest: drier | 202.593 |
| | Appalachian (hemlock)-northern hardwood forest: moist-cool | 202.593 |
| | Appalachian (hemlock)-northern hardwood forest: typic | 202.593 |
| | Central Appalachian dry oak-pine forest | 202.591 |
| | Laurentian-Acadian northern hardwood forest: high conifer | 201.564 |
| | Laurentian-Acadian northern hardwood forest: moist-cool | 201.564 |
| | Laurentian-Acadian northern hardwood forest: red oak-northern hardwood forest | 201.564 |
| | Laurentian-Acadian northern hardwood forest: typic | 201.564 |
| | Laurentian-Acadian pine-hemlock-hardwood forest: moist-cool | 201.563 |
| | Laurentian-Acadian pine-hemlock-hardwood forest: typic | 201.563 |
| | North Atlantic coastal plain dry hardwood forest | 203.475 |
| | Northeast coastal and interior pine-oak forest | 203.999 |
| | Northeastern interior dry-mesic oak forest: moist/cool | 202.592 |
| | Northeastern interior dry-mesic oak forest: typic | 202.592 |

| North Atlantic LCC General Habitat Type[1] | The Nature Conservancy's Northeastern Terrestrial Habitat Classification[2] | CES Code[3] |
|---|---|---|
| Hardwood swamp | Atlantic coastal plain northern basin peat swamp | 203.522 |
| | North-Central Appalachian acidic swamp: bigger river floodplain | 202.604 |
| | North-Central Appalachian acidic swamp: isolated | 202.604 |
| | North-Central Appalachian acidic swamp: pond/lake | 202.604 |
| | North-Central Appalachian acidic swamp: stream/river riparian | 202.604 |
| | North-Central Interior and Appalachian rich swamp: bigger river floodplain | 202.605 |
| | North-Central Interior and Appalachian rich swamp: isolated | 202.605 |
| | North-Central Interior and Appalachian rich swamp: pond/lake | 202.605 |
| | North-Central Interior and Appalachian rich swamp: stream/river riparian | 202.605 |
| | North-central interior wet flatwoods: bigger river floodplain | 202.700 |
| | North-central interior wet flatwoods: isolated | 202.700 |
| | North-central interior wet flatwoods: stream/river riparian | 202.700 |
| Pine barrens and maritime forest | North Atlantic coastal plain maritime forest | 203.302 |
| | North-Central Appalachian pine barrens | 202.590 |
| Shrub swamp and floodplain forest | Laurentian-Acadian floodplain forest | 201.587 |
| | Laurentian-Acadian wet meadow-shrub swamp: bigger river floodplain | 201.582 |
| | Laurentian-Acadian wet meadow-shrub swamp: isolated | 201.582 |
| | Laurentian-Acadian wet meadow-shrub swamp: pond/lake | 201.582 |
| | Laurentian-Acadian wet meadow-shrub swamp: stream/river riparian | 201.582 |
| Woodlands (natural) | Central Appalachian alkaline glade and woodland | 202.602 |
| | Central Appalachian pine-oak rocky woodland | 202.600 |
| **Non-forested Uplands and Wetlands** | | |
| Alpine tundra and krummholz | Acadian-Appalachian alpine barrens | 201.567 |
| Cliff and Talus | Laurentian-Acadian acidic cliff and talus | 201.569 |
| | Laurentian-Acadian calcareous cliff and talus | 201.570 |
| | North-central Appalachian acidic cliff and talus | 202.601 |
| | North-central Appalachian circumneutral cliff and talus | 202.603 |

| North Atlantic LCC General Habitat Type[1] | The Nature Conservancy's Northeastern Terrestrial Habitat Classification[2] | CES Code[3] |
|---|---|---|
| Freshwater marshes | Laurentian-Acadian freshwater marsh: bigger river floodplain | 201.594 |
| | Laurentian-Acadian freshwater marsh: isolated | 201.594 |
| | Laurentian-Acadian freshwater marsh: pond/lake | 201.594 |
| | Laurentian-Acadian freshwater marsh: stream/river riparian | 201.594 |
| Old fields and shrubland | Open shrublands/grasslands | n/a |
| Pasture/Hay/Grassland | Agriculture | n/a |
| Peatland | Boreal-Laurentian bog – Saco heath | 103.581 |
| | Boreal-Laurentian-Acadian acidic basin fen | 201.583 |
| | Boreal-Laurentian-Acadian acidic basin fen: isolated | 201.583 |
| | Boreal-Laurentian-Acadian acidic basin fen: stream/river riparian | 201.583 |
| | Laurentian-Acadian acidic alkaline fen: isolated | 201.585 |
| | Laurentian-Acadian acidic alkaline fen: stream/river riparian | 201.585 |
| | North-central interior and Appalachian acidic peatland: isolated | 202.606 |
| Rocky outcrop | Northern Appalachian-Acadian rocky heath outcrop | 201.571 |
| | Laurentian-Acadian calcareous rocky outcrop | 201.572 |
| **Inland Aquatic Habitats** | | |
| Open water | Water | n/a |
| **Coastal Non-forested Uplands** | | |
| Dunes and maritime grasslands | Atlantic coastal plain northern dune and maritime grassland | 203.264 |
| | Northern Atlantic coastal plain heathland and grassland | 203.895 |
| Rocky coast and islands | Acadian-North Atlantic rocky coast | 201.573 |
| **Coastal Wetlands and Aquatic Habitats** | | |
| Salt marsh | Northern Atlantic coastal plain tidal salt marsh | 203.519 |
| **Other** | | |
| Developed | Developed | n/a |

1 - North Atlantic Landscape Conservation Collaborative general habitat typings for USFWS representative species; linked to the National Vegetation Classification System (NVCS)

2 - Habitat description derived from The Nature Conservancy's (TNC) Northeastern Terrestrial Habitat Classification. More detailed habitat tables that include the Northeastern Terrestrial Habitat Classification System habitat types are available for each CFA and refuge unit online at: http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.

3 - Community Element Type: derived from TNC's Northeastern Terrestrial Habitat Classification originated from NatureServe's U.S Terrestrial Classification System codes; linked to NVCS

USFWS

*Wildlife festival, Vermont*

# Bibliography

■ **Appendix A Bibliography**

# Appendix A Bibliography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Appendix B

Bill Thompson

*Blackburnian warbler*

# Process for Establishing Priority Refuge Resources of Concern

- Introduction
- Process for Establishing Priority Refuge Resources of Concern
- Literature Citations

## Introduction

This appendix describes the process we followed to establish priority resources of concern for Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge, the refuge). Priority refuge resources of concern are determined using a multitude of mandates, policies, purposes, and regional and national conservation plans. They also guide the development of refuge biological goals and objectives. These goals and objectives serve as the foundation for developing refuge Comprehensive Conservation Plans (CCPs), as well as, step-down plans such as Habitat Management Plans (HMPs) and Inventory and Monitoring Plans (IMPs).

Priority refuge resources of concern include flora and fauna that are of high conservation concern. The process results in selecting species which will benefit from refuge management and will also be the most effective ecological contribution within the Connecticut River watershed ecosystem and the National Wildlife Refuge System (Refuge System). The resources of concern and their associated habitats were identified during the CCP process following the guidelines and process discussed here.

## Process for Establishing Priority Refuge Resources of Concern

The CCP Planning Team used the procedure outlined in the U.S. Fish and Wildlife Service's (Service) guidance "Identifying Refuge Resources of Concern and Management Priorities: A Handbook" (Pavelgio and Taylor 2010) to establish priority refuge resources of concern. According to the Service policy on habitat management plans (620 FW 1), resources of concern include, "all plan and/or animal species, species groups, or communities specifically identified in refuge purpose(s), [Refuge] System mission, or international, national, regional, state, or ecosystem conservation plans or acts."

This team referred to Service mandates, compiled resource information, and consulted experts to create a comprehensive list of species and habitats that could be of management concern for the refuge. This list addressed a broad range and high number of conservation needs, and therefore, was reduced to include those species that were the highest priority for conservation, and whose core range was within the Connecticut River watershed. This list of priority resources of concern will be used to guide conservation and management efforts within the Connecticut River watershed. For each refuge unit and proposed Conservation Focus Area (CFA), we selected a subset of these resources to focus our management on (all existing refuge divisions are covered by a proposed CFA). Our discussion below corresponds to the steps listed in the handbook.

**1.0) Collect information and data**

**1.1) Mandates for management on refuges**

Primary legal mandates and Service policies direct priorities for wildlife and habitat management on refuges, and guide the process for selecting resources of concern. Management mandates include policy and law that: (1) identify refuge purposes, (2) that govern management of refuges and Refuge System resources of concern, and (3) that directs management to achieve biological integrity, diversity, and environmental health on each refuge.

<u>Refuge Purposes</u>

Conte Refuge was established under the Silvio O. Conte National Fish and Wildlife Refuge Act, which lists the following refuge purposes:

(1) To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants fish and wildlife.

(2) To conserve, protect, and enhance the natural diversity and abundance of plant, fish, and wildlife species and the ecosystem upon which these species depend within the refuge.

(3) To protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act (ESA) of 1973 as amended (16 U.S. 1531 *et seq.*).

(4) To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.

(5) To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.

(6) To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

**Table B.1. Summary of the Establishment of Conte Refuge**

| State | Division/Unit | Year Division or Unit Established | Resource Values Identified at Acquisition |
|---|---|---|---|
| VT | Nulhegan Basin Division | 1999 | Extensive contiguous forest for breeding migrant landbirds and wetland habitat for nesting waterfowl. A viable population of spruce grouse and at least 13 rare plant and animal species occur on site. Important deer wintering area. |
| | Putney Mountain Unit | 1999 | Northeastern bulrush, a federally listed species, occurs within this unit. |
| MA | Third Island Unit | 1997 | Riparian habitat provides spawning areas for American shad, blueback herring, and shortnose sturgeon. Bald eagle nest site, largest fresh water mussel population, and 30 rare plant and animal species occur. |
| | Honeypot Road Wetlands Unit | 1999 | Consists of a complex of vernal pools and scrub/shrub wetlands and hosts three rare vertebrates and two rare invertebrate species. |
| | Wissatinnewag Unit | 2001 | Steep, hardwood forest on south facing slope that provides important migratory bird stopover habitat in the spring and nesting passerine birds. |
| | Mount Tom Unit | 2002 | Large block of contiguous forest that hosts a diversity and abundance of migrant land birds and raptors. Bald eagles nest in this area, and over 30 rare plant and animal species occur. |
| | Mount Toby Unit | 2003 | Extensive contiguous forest and small wetlands provide breeding habitat for migrant landbirds. About 20 rare plant and animal species occur. |
| | Fort River Division | 2005 | Potential for managing as a large block of contiguous grassland habitat for upland sandpipers, grasshopper sparrows, savannah sparrows, and bobolinks. Dwarf wedgemussel, a federally listed species, occurs in the Fort River. |
| | Mill River Division | 2007 | Floodplain forest that is key stopover habitat for migratory landbirds and waterfowl during spring and fall. |
| | Dead Branch Division | 2011 | This area includes riverine and riparian habitat for spawning blueback herring, American shad, sea-run Atlantic salmon (naturally reproducing population). |
| | Westfield River Division | 2013 | Over 1,000 feet of key riparian habitat, mixed hardwoods that benefit breeding migratory birds, vernal pools. Part of an unusually large expanse of minimally fragmented forest. |

| State | Division/Unit | Year Division or Unit Established | Resource Values Identified at Acquisition |
|---|---|---|---|
| NH | Pondicherry | 2000 | This area includes a wetland complex that provides habitat for great blue heron (rookery), and stop-over habitat for waterfowl including wood ducks, ring-necked ducks, and black ducks. |
| | Blueberry Swamp | 2007 | Extensive area of pasture, hayfields, and old fields reverting to shrubs and forest. Also includes small fens and swamps. Breeding habitat for marsh hawks (northern harriers) and grassland birds, and hosts 10 rare plants. |
| CT | Deadman's Swamp Unit | 2005 | This area includes alluvial floodplain forest and freshwater marsh. Floodplain forest provides breeding habitat for migrant landbirds, and the marsh is used by wading birds and waterfowl. Sora rail, black rail, and yellow-breasted chat have been recorded, and the federally threatened Puritan tiger beetle occurs on this site. Last species discovered after the refuge's 1995 Final Environmental Impact Statement (FEIS). |
| | Roger Tory Petersen Unit | 2012 | This area includes a tidally influenced riverine habitat important for spawning blueback herring, alewives, and sea-run Atlantic salmon (naturally reproducing population). |
| | Salmon River | 2009 | This area includes a tidally influenced riverine habitat important for spawning blueback herring, alewives and sea-run Atlantic salmon (naturally reproducing population). |

**Special Focus Areas may cover a larger area than the current refuge units/division acreages*

**Table B.2. Summary of Species and Habitats Identified in Silvio O. Conte National Fish and Wildlife Refuge Act Establishment Purposes**

| Species, Species Group, or Habitat | Life History Requirements and Supporting Habitat Type(s) |
|---|---|
| Atlantic salmon | *Migration and Spawning:* Connecticut River and tributaries. |
| American shad | *Migration and Spawning:* Connecticut River and tributaries. |
| River herring | *Migration and Spawning*: Fast moving, shallow water in the Connecticut River and tributaries. |
| Shortnose sturgeon | *Migration and Spawning:* Connecticut River main stem. |
| Bald eagle | *Nesting:* Mature forests adjacent to open water habitats.<br>*Foraging:* Open water, including Connecticut River main stem.<br>*Wintering:* Lower Connecticut River main stem and estuary. |
| Peregrine falcon | *Nesting:* Cliff and talus systems.<br>*Foraging:* Open water habitats and associated herbaceous wetlands. |
| Osprey | *Nesting:* Mature Forests or elevated platforms adjacent to open water.<br>*Foraging:* Open water including Connecticut River main stem. |

| Species, Species Group, or Habitat | Life History Requirements and Supporting Habitat Type(s) |
|---|---|
| American black duck | *Breeding and Migrating:* Herbaceous and forested wetlands, shallow lakes with emergent vegetation, bogs in boreal forests.<br><br>*Wintering:* Open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging, as well as tidal wetlands. |
| Federally listed and candidate species | **Current federally listed and candidate species:**<br><br>**Dwarf wedgemussel**–*Year-round:* Connecticut River and tributaries.<br>**Puritan tiger beetle**–*Year-round:* Sandy beaches of the Connecticut River and tributaries.<br>**New England cottontail**–*Year-round:* Early successional forests, shrub-swamps.<br>**Jessup's milkvetch**–*Year-round:* Shoreline habitat of the Connecticut River and tributaries.<br>**Northeastern bulrush**–*Year-round:* Herbaceous wetlands.<br>**Small-whorled pogonia–***Year-round:* Hardwood forests.<br>**Canada lynx–***Year round:* Spruce-fir forests.<br>**Rufa red knot**–*Breeding:* Sandy beaches at the mouth of Connecticut River.<br>**Northern long-eared bat**–*Breeding and Roosting:* Mature forests.<br>*Wintering:* Caves. |
| Wetlands | **Wetland Habitat Types within the Refuge:**<br><br>**Freshwater Marshes–**Dominated by herbaceous vegetation including jewel weed, common bulrush, narrow-leaved cattail, marsh fern, water lily, wild rice and sedges.<br><br>**Peatlands–**Includes acidic and alkaline fens and acidic peatlands. These wetlands are dominated by sphagnum moss, as well as leather leaf, bog rosemary, sheep laurel, pitcher plant, cotton grass, and often scattered with stunted black spruce.<br><br>**Conifer Swamps–**Includes swamps dominated by conifer trees such as northern white cedar, red spruce, balsam fir, eastern hemlock, and American larch. The herbaceous and shrub layer tends to be species poor, but depends on the soils, and may include red-osier dogwood, catberry, ferns, and ephemerals.<br><br>**Hardwood Swamps–**Includes swamps dominated by deciduous trees such as red-maple, black ash, swamp white oak, and pin oak. Shrubs and herbaceous layer may include buttonbush, holly, ferns, and sedges.<br><br>**Shrub Swamps and Floodplain Forests–**Shrub swamps are dominated by shrubs including alder, willow, meadowsweet, dogwood, sedges, and rushes. Floodplain forests are often dominated by silver maple mixed with red maple, ash, and oaks. Shrubs include black willow, viburnums, and silky dogwood. The herb layer includes ferns and spring ephemerals.<br><br>**Salt Marsh–**Includes intertidal marshes where salinity levels are between 5 and 50 parts per thousand). Salt tolerant species occur such as cordgrass, glasswort, switchgrass, sedges, rushes, and eastern red cedar in the higher portions of the marsh. |

National Wildlife Refuge System Policy

The Refuge System Improvement Act requires that each refuge be managed to fulfill both its establishment purpose(s) and the mission of the Refuge System. Where there is conflict, individual refuge purposes have priority.

Section 4(a)(3) of the Refuge System Improvement Act states, "(A) each refuge shall be managed to fulfill the Mission of the System, as well as the specific purposes for which that refuge was established…..

[Refuge System Mission] . . . to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." [Refuge System Improvement Act, Section 4(a)(2)]

Refuge System resources of concern are identified in the National Wildlife Refuge System Mission, Goals, and Refuge Purposes Policy (601 FW 1). The first three Refuge System goals (601 FW 1.8) identify these resources of concern, and are stated below.

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their range.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.

These Refuge System resources of concern (migratory birds, interjurisdictional fish, federally listed endangered and threatened species, and certain marine mammals) are collectively and individually referred to as Federal trust resources.

Biological integrity, diversity, and environmental health

The Improvement Act further states, "In administering the System, the Secretary shall...ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans..."

To meet this mandate the Service developed a biological integrity, diversity, and environmental health policy (BIDEH) to provide implementation guidance (601 FW 3). The policy uses historical conditions and the evaluation of a refuge at various landscape scales, including refuge, ecosystem, national, and international scales, to determine the integrity and environmental health of a refuge's lands and its contribution to biological diversity.

**Table B.3. Summary of Biological Integrity, Diversity, and Environmental Health (BIDEH) Attributes for Conte Refuge**

| Refuge Unit/Division | Habitats (Plant communities that represent existing BIDEH) | Habitat Attributes (Please see priority refuge resources of concern table in appendix A for details on these communities in each CFA.) | Natural Processes Responsible for these Conditions | Limiting Factors |
|---|---|---|---|---|
| –Salmon River<br>–Salmon Brook<br>–Maromas<br>–Farmington River<br>–Westfield River<br>–Dead Branch<br>–Mascoma<br>–Ashuelot<br>–White River<br>–West River<br>–Ottauquechee River<br>–Ompompanoosuc River<br>–Nulhegan Basin | Cliff and talus | Open outcrop, large and small, where the slope is greater than 60 degrees (Thompson and Sorenson 2000). The vegetation surrounding these outcrops varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. | –Bedrock type<br>–Temperature<br>–Wind | –Development (wind, ski resorts)<br>–Mining<br>–Invasive species<br>–Recreation overuse |

| Refuge Unit/Division | Habitats (Plant communities that represent existing BIDEH) | **Habitat Attributes** (Please see priority refuge resources of concern table in appendix A for details on these communities in each CFA.) | Natural Processes Responsible for these Conditions | Limiting Factors |
|---|---|---|---|---|
| –Whalebone Cove<br>–Salmon River<br>–Salmon Brook<br>–Maromas<br>–Farmington River<br>–Wissatinnewag Unit<br>–Westfield River<br>–Dead Branch<br>–Sprague Brook<br>–Mascoma<br>–Ashuelot<br>–White River<br>–West River<br>–Ottauquechee River | Woodlands (natural) | Open or sparsely wooded hilltops and outcrops or rocky slopes. The vegetation is patchy, with woodland as well as open herbaceous or grassy portions. | –Fire<br>–Bedrock type | –Invasive species<br>–Lack of fire<br>–Fragmentation |
| –Whalebone Cove | Rocky coast and islands | A narrow zone between the high tide line and the upland or entirely surrounded by water. Cover is patchy shrubs and sparse non-woody vegetation, sometimes with a few stunted trees. | –Wind<br>–Salt spray<br>–Fog<br>–Flooding | –Invasive species<br>–Sea level rise |
| –Whalebone Cove<br>–Roger Tory Peterson Unit | Salt marsh | Includes intertidal marshes where salinity levels are between 5 and 50 (ppt). Dominated by salt tolerant sedges, grasses, and rushes. May have scattered shrubs in the higher portions of the marsh. | –Salt spray<br>–Flooding | –Invasive species<br>–Sea level rise<br>–Drainage ditches |
| –Whalebone Cove<br>–Salmon River<br>–Maromas<br>–Dead Man's Swamp<br>–Westfield River<br>–Honeypot Wetlands Unit<br>–Sprague Brook<br>–Mascoma<br>–Ottauquechee River | Hardwood swamp | These swamps are dominated by deciduous trees such as red-maple, black ash, swamp white oak, and pin oak. Shrubs and herbaceous layer may include buttonbush, holly, ferns, and sedges. Saturation can vary depending on soil type and rain events. | –Flooding<br>–Soil type<br>–Fire<br>–Drought | –Development<br>–Invasive species<br>–Sea level rise (near CT River main stem)<br>–Lack of fire<br>–Heavy logging |

| Refuge Unit/Division | Habitats (Plant communities that represent existing BIDEH) | **Habitat Attributes**<br>(Please see priority refuge resources of concern table in appendix A for details on these communities in each CFA.) | Natural Processes Responsible for these Conditions | Limiting Factors |
|---|---|---|---|---|
| –Salmon Brook<br>–Maromas<br>–Deadman's Swamp<br>–Blueberry Swamp<br>–White River<br>–Ottauquechee River<br>–Nulhegan Basin | Freshwater marsh | Dominated by herbaceous vegetation with scattered shrubs and trees. The substrate is typically muck over mineral soil. They occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams or rivers, and/or impoundments or ditches. | –Flooding<br>–Soils | –Invasive species<br>–Drainage ditches<br>–Sea level rise |
| –Farmington River<br>–Westfield River<br>–Mascoma<br>–Blueberry Swamp<br>–Ashuelot<br>–White River<br>–West River<br>–Ottauquechee River<br>–Ompompanoosuc River<br>–Nulhegan Basin | Rocky outcrop | Occurs on ridges or summits of erosion-resistant acidic bedrock. The vegetation is patchy, often a mosaic of woodlands and open glades. | –Exposure<br>–Fire | –Lack of fire<br>–Invasive species |
| –Mascoma<br>–Ashuelot<br>–White River<br>–West River | Peatlands | These communities' include acidic and alkaline fens and acidic peatlands. They occur in basins or along shorelines of streams and lakes. Sphagnum moss is the dominant species, as well as grasses, low shrubs from the Ericaceae family, and stunted trees such as black spruce. | –Water source<br>–Bedrock type | –Adjacent development<br>–Recreation<br>–Peat extraction<br>–Heavy logging adjacent to wetland |
| –White River<br>–West River<br>–Ottauquechee River | Conifer swamp | These swamps are dominated by coniferous trees such as northern white cedar, spruce, balsam fir, and American larch. The herbaceous and shrub layer tends to be species poor, but often depends on the soil type and pH level.<br>These wetlands may remain saturated for all or nearly all of the growing season, and may have standing water seasonally. | –Flooding<br>–Wind<br>–Drought | –Development<br>–Invasive species<br>–Heavy logging |

| Refuge Unit/Division | Habitats (Plant communities that represent existing BIDEH) | Habitat Attributes (Please see priority refuge resources of concern table in appendix A for details on these communities in each CFA.) | Natural Processes Responsible for these Conditions | Limiting Factors |
|---|---|---|---|---|
| –White River<br>–Ottauquechee River | Shrub swamp and floodplain forest | Shrub swamps are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The system can have a patchwork of shrub and grass dominance, and trees are generally absent and, if present, are scattered.<br>Floodplain forests are often dominated by silver maple, and other deciduous tree species, such as oak and ash. The understory tends to be species rich dominated by shrubs, ferns, and ephemerals. These forests occur along river systems, and are often flooded during high water events. | –Flooding<br>–Drought<br>–Beaver | –Clearing for agriculture<br>–Development<br>–Contaminants |

**1.2) Compile a comprehensive list of potential resources of concern**

A comprehensive list of species and habitats that could be of management concern for the refuge was developed by the CCP planning team based on various conservation plans, expert opinions, species and habitat distribution maps, and current inventory data. Appendix M has a comprehensive list of these conservation plans.

Conservation plans

Sources used to compile the list of resources of concern included:

- 2008 USFWS Birds of Conservation Concern for Bird Conservation Region 30.
- 2008 USFWS Birds of Conservation Concern for Bird Conservation Region 14.
- 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.
- 2010 Federal Threatened and Endangered Species including Candidate.
- 2010 Federal Elevated Concern species petitioned for Threatened an Endangered Species.
- 2011 Technical Paper of Representative Species.
- 2009 to 2013 U.S. Fish and Wildlife Service's Northeast Region Fisheries Program Strategic Plan.
- Silvio O. Conte National Fish and Wildlife Refuge Purpose Species.
- 2008 New England/Mid-Atlantic Coast Bird Conservation Region (BCR 30) Implementation Plan.
- 2006 Blueprint for the Design and Delivery of Bird Conservation in the Atlantic Northern Forest (BCR 14).

- International Union for Conservation of Nature.
- 2006 New Hampshire Wildlife Action Plan.
- 2005 Vermont Wildlife Action Plan.
- 2005 Massachusetts Comprehensive Wildlife Conservation Strategy.
- 2005 Connecticut Comprehensive Wildlife Conservation Strategy.

Gather expert opinion

Between 2009 and 2012, we held various meetings in each state in the watershed—Connecticut, Massachusetts, New Hampshire, and Vermont—to discuss key issues for the refuge CCP. These meetings created an open dialogue for local experts from each state, Audubon Society, and The Nature Conservancy (TNC) to provide feedback regarding the refuges role within the Connecticut River watershed. In addition to these meetings, local experts were provided draft CCP documents for review, and given the opportunity to provide additional comments. Their feedback further developed the comprehensive list of resources of concern, and refuge habitat management direction.

The general consensus was that the refuge should take an active role in:

- Enhancing and restoring floodplain and riparian forest.
- Enhancing the health of the Connecticut River main stem and conserving aquatic species of conservation concern.
- Providing connectivity between other conservation lands.
- Conserving biologically diverse areas, and large blocks of unfragmented habitats.
- Conserving threatened and endangered species and candidate species.
- Managing forested habitats to provide a diversity of successional stages.
- Conserving habitat for migratory species including bats, fish, and landbirds.

Develop maps

We developed maps of species and habitat distributions within the watershed to assist with the development of the priority resources of concern list. The following is a list of maps used throughout the CCP process.

- Current Vegetation Map–using habitat data from TNC North East Terrestrial Habitat Mapping Project which is linked to the National Vegetation Classification System.
- Landbird species distribution and breeding bird survey relative abundance maps.
- Fisheries species distribution maps.
- Federally endangered and threatened species distribution maps.
- Existing conserved lands from TNC.
- Representative State Heritage Program maps.

Compile existing data

Partner agencies provided wildlife and plant species inventory data for proposed CFAs. Data was also compiled from surveys and inventories that were conducted on current refuge divisions. The following is a list of surveys and inventories conducted on current refuge divisions which contributed to the selection of priority resources of concern.

*Landbirds*

Breeding landbirds have been surveyed at Nulhegan Basin Division from 2000 to 2006 and Pondicherry Division from 2004 to 2006 and 2009 to 2011 using point count methodology, following a Regional protocol. Points were established in various habitat types, and vegetation structure data was collected at each survey point.

A Monitoring Avian Productivity and Survivorship (MAPS) banding station collected data on landbird populations within the Nulhegan Basin Division from 2003 to 2012.

Canada warblers were monitored on the Nulhegan Basin Division, as part of a larger study effort, to obtain and model habitat-specific estimates of productivity, survivorship, dispersal, and site fidelity for northeast Vermont.

Neotropical migrant birds were surveyed in four sub-watersheds of the Connecticut River including the Farmington River watershed in Connecticut, the Deerfield River watershed in Massachusetts, the Ashuelot River watershed in New Hampshire, and the White River watershed in Vermont. The goal was to determine the importance of the Connecticut River watershed to neotropical migrants, and the habitat types used most often during migration. Twelve transects were established in each sub-watershed at specific geographic locations, and each transect was surveyed 6 different times throughout the spring each year, for 3 years (1996-1998). This survey effort was part of a study conducted by Smith College and Manomet Center for Conservation Sciences, and details can be found at: *http://www.science.smith.edu/stopoverbirds/* (accessed September 2013).

Owls were surveyed on the Nulhegan Basin Division in 2000, and 2001 to 2005 using a playback methodology to determine species presence, abundance, and distribution on the refuge. Spruce grouse breeding surveys are conducted on the Nulhegan Basin Division to determine presence, abundance and distribution.

*Shorebirds*

American woodcock have been surveyed at Nulhegan Basin Division from 2000 to 2013 to understand woodcock relative abundance, distribution, and use of Division habitats. Spring singing ground surveys are conducted each year along road transects, and, over the past 6 years, along walking routes within three woodcock management units. Roosting surveys were conducted in the summer months of 2009 and 2010 within the roosting areas of these units.

*Forest inventory*

A forest-based habitat inventory was conducted on the Nulhegan Basin and Pondicherry Divisions in 2007. Approximately, 2,600 points at Nulhegan Basin and 560 points at Pondicherry were surveyed for forest stand characteristics including species composition, stand structure, understory and midstory characteristics, fuel load, age class, height class and crown closure.

*Aquatic resource surveys*

A biological survey of fish and macroinvertebrates was conducted on the Nulhegan Basin Division in 2000 as part of a biological diversity survey effort conducted on the former Champion International Lands. Aquatic habitat assessments investigating fish passage and in-stream features have been conducted at the Nulhegan Basin Divison since 2009.

*Mid-sized carnivores*

Snow tracking surveys were conducted on the Nulhegan Basin Division and surrounding area to better understand lynx distribution in Vermont. Surveys were conducted during the winter of 2012. A protocol similar to the one developed in Maine to detect lynx presence was used. Other species were also documented during the survey effort including bobcat and fisher. A remote camera station was set-up in 2013 in an area that was being heavily used by lynx.

*Small mammals*

A small mammal inventory was conducted in 2000 on the Nulhegan Basin Division as part of a biological diversity survey effort conducted on the former Champion International Lands. Baited Sherman live traps and Museum Special snap traps were used for ground dwelling small mammals, while mist nests and acoustic monitors were used to survey bats. Bat acoustic surveys were also conducted at the Nulhegan Basin and Pondicherry Divisions in 2012 and 2013.

*Natural communities and rare vascular plant inventory*

Natural communities mapping and a rare plant inventory occurred in 2001 as part of a biological diversity survey effort conducted on the former Champion International Lands. Natural community mapping was updated in 2012 for new acquisition at the Nulhegan Basin Division, and in current ownership at the Blueberry Swamp Division.

*Invertebrate surveys*

Invertebrates have been inventoried at Pondicherry and Nulhegan Basin Division by entomologists on different occasions to determine species presence.

*Waterfowl brood surveys*

Waterfowl brood surveys were conducted at the Nulhegan Basin Division in 2000 as part of a biological diversity survey effort conducted on the former Champion International Lands, and conducted again in 2008.

*Marsh birds*

Marsh birds have been inventoried at the Nulhegan Basin Division in 2000 as part of a biological diversity survey effort conducted on the former Champion International Lands. Marsh birds were also surveyed at the Pondicherry Division in 2012 using a national and standardized protocol.

*Amphibian and reptile surveys*

Amphibian breeding surveys were conducted at the Pondicherry Division in 2005 and 2006, and on the Nulhegan Basin Division from 2001 to 2005 to document species presence and abundance. Survey procedures from a standardized protocol recorded species based on breeding amphibian calls. Reptiles and amphibians were inventoried using various survey methods at the Nulhegan Basin Division in 2001 as part of a biological diversity survey effort conducted on the former Champion International Lands. Survey methods include, active searches, night-time and day-time road searches, and trapping with minnow and hoop traps. Data was also collected on vernal pools including spatial data, productivity level, and pool measurements (length, width, and depth).

*Invasive plant inventory*

An inventory of invasive plant species has been conducted on the Nulhegan Basin Division, Pondicherry Division, Blueberry Swamp Division, Salmon River Division, Putney Mountain Unit, and Fort River Division.

## 2.0) Identify Potential Priority Refuge Resources of Concern in the Watershed

A comprehensive list of resources of concern was developed for the Connecticut River watershed using the information described above. These resources are a high priority for conservation based on their ranking in the specific plans identified in step 1.2. All of these species are present within the Connecticut River watershed, and species whose habitat needs are currently available or can be restored. See table B.4 for complete list of resources of concern within the watershed.

**Table B.4. Comprehensive List of Resources of Concern for the Connecticut River Watershed**

| Species Common Name | LCC[1] | BCC (BCR 30)[2] | BCC (BCR 14)[2] | Federally Threatened and Endangered Species | Petitioned for Federal Listing[3] | Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013 | Listed in Refuge Purposes | BCR 30[4] | BCR 14[4] |
|---|---|---|---|---|---|---|---|---|---|
| Alewife | x | | | | | x | x | | |
| American bittern | | x | x | | | | | M | M |
| American black duck | x | x | x | | | | x | HH | HH |
| American eel | | | | | x | x | | | |
| American oystercatcher | x | x | | | | | | HH | M |
| American redstart | | | | | | | | | HR |
| American shad | x | | | | | x | x | | |

| Species Common Name | LCC[1] | BCC (BCR 30)[2] | BCC (BCR 14)[2] | Federally Threatened and Endangered Species | Petitioned for Federal Listing[3] | Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013 | Listed in Refuge Purposes | BCR 30[4] | BCR 14[4] |
|---|---|---|---|---|---|---|---|---|---|
| American woodcock | x | x | x | | | | | HH | HH |
| Atlantic salmon | x | | | | | x | x | | |
| Atlantic sturgeon | | | | x | | x | | | |
| Bald eagle | | x | x | | | | x | M | M |
| Baltimore oriole | | | | | | | | HR | |
| Bicknell's thrush | x | | x | | x | | | H | HH |
| Black-and-white warbler | | | | | | | | HR | |
| Black-billed cuckoo | | | | | | | | | HR |
| Blackburnian warbler | | | | | | | | | HR |
| Black-throated blue warbler | | | | | | | | | HR |
| Black-throated green warbler | | | | | | | | | HR |
| Blueback herring | | | | | | x | x | | |
| Blue-winged warbler | x | x | x | | | | | HH | H |
| Boreal chickadee | | | | | | | | | HR |
| Broad-winged hawk | | | | | | | | HR | |
| Brook floater | | | | | x | | | | |
| Brook trout | x | | | | | x | | | |
| Brown thrasher | | | | | | | | HR | |
| Bufflehead | | x | | | | | | H | |
| Canada goose, Atlantic | x | x | | | | | | HH | |
| Canada goose, north Atlantic | | x | x | | | | | H | H |
| Canada warbler | x | | x | | | | | M | HH |
| Canada Lynx | | | | x | | | | | |
| Chestnut-sided warbler | | | | | | | | | HR |
| Chimney swift | | | | | | | | HR | |
| Cobblestone tigerbeetle | | | | | x | | | | |
| Dwarf wedgemussel | x | | | x | | x | | | |
| Eastern kingbird | | | | | | | | HR | |
| Eastern small-footed bat | | | | | x | | | | |
| Eastern towhee | | | | | | | | HR | |
| Field sparrow | | | | | | | | HR | |
| Gray catbird | | | | | | | | HR | |
| Great crested flycatcher | | | | | | | | HR | |
| Jesup's milk-vetch | x | | | x | | | | | |

| Species Common Name | LCC[1] | BCC (BCR 30)[2] | BCC (BCR 14)[2] | Federally Threatened and Endangered Species | Petitioned for Federal Listing[3] | Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013 | Listed in Refuge Purposes | BCR 30[4] | BCR 14[4] |
|---|---|---|---|---|---|---|---|---|---|
| Least tern | | x | | | | | | H | |
| Lesser yellowlegs | | x | x | | | | | M | |
| Little brown bat | | | | | x | | | | |
| Louisiana waterthrush | | | | | | | | HR | |
| Mallard | | x | | | | | | H | |
| Marsh wren | | | | | | | | HR | |
| New England cottontail rabbit | x | | | x | | | | | |
| Northeastern bulrush | x | | | x | | | | | |
| Northern flicker | | | | | | | | HR | |
| Northern long-eared bat | | | | x | | | | | |
| Northern parula | | | | | | | | | HR |
| Olive-sided flycatcher | | | x | | | | | | H |
| Osprey | | | | | | | x | | |
| Peregrine falcon | | x | x | | | | x | | M |
| Pied-billed grebe | | x | x | | | | | | |
| Piping Plover | x | | | x | | | | HH | HH |
| Prairie warbler | x | x | | | | | | HH | |
| Puritan tiger beetle | x | | | x | | | | | |
| Purple finch | | | | | | | | | HR |
| Red Knot | x | x | x | x | | | | HH | |
| Rose-breasted grosbeak | | | | | | | | | HR |
| Ruffed grouse | | | | | | | | | HR |
| Rusty blackbird | | x | x | | | | | H | H |
| Saltmarsh sparrow | x | x | x | | | | | HH | |
| Scarlet tanager | | | | | | | | HR | |
| Seaside sparrow | x | x | | | | | | M | |
| Semipalmated sandpiper | x | x | x | | | | | H | HH |
| Short-billed dowitcher | | x | | | | | | H | H |
| Shortnose sturgeon | x | | | x | | x | x | | |
| Small-whorled pogonia | x | | | x | | | | | |
| Snowy egret | | x | x | | | | | M | |
| Solitary sandpiper | | x | x | | | | | H | |
| Tri-colored bat | | | | | x | | | | |
| Veery | | | | | | | | | HR |

| Species Common Name | LCC[1] | BCC (BCR 30)[2] | BCC (BCR 14)[2] | Federally Threatened and Endangered Species | Petitioned for Federal Listing[3] | Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013 | Listed in Refuge Purposes | BCR 30[4] | BCR 14[4] |
|---|---|---|---|---|---|---|---|---|---|
| Whip-poor-will | | x | | | | | | H | M |
| Willow flycatcher | | | | | | | | HR | |
| Wood duck | | | x | | | | | M | M |
| Wood thrush | x | x | x | | | | | HH | HH |
| Worm-eating warbler | | x | | | | | | H | |
| Yellow-bellied sapsucker | | | | | | | | | HR |
| Yellow-throated vireo | | | | | | | | HR | |

**Reference Notes:**

[1] *LCC–2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan.*

[2] *BCC (BCR 30, 14)–2008 USFWS Birds of Conservation Concern for Bird Conservation Regions 30 and 14.*

*Note: The resident game species and waterfowl were added to this list from the Land Acquisition Priority System.*

[3] *Species petitioned to be federally listed as threatened or endangered as of 2010.*

[4] *BCR–Bird Conservation Region Plans–Rankings: HH–highest; H–high; M–medium; HR–high BCR responsibility.*

### 3.0) Select priority refuge resources of concern for refuge units and proposed CFAs

The "Comprehensive list of refuge resources of concern for the Connecticut River watershed" addresses a broad range and high number of conservation needs. This list is too broad and extensive, and does not allow for focused and effective resource conservation within each CFA or refuge unit. Priority refuge resources of concern were selected from this comprehensive list using a "focal resources" concept. Focal resources are associated with conditions that represent the needs of larger groups of species that have similar requirements and respond to management similarly (Pavelgio and Taylor 2010). The species selected will prioritize and focus management within individual CFAs, and units that are located outside of a CFA boundary. Occasionally, we chose a priority "resource" that is not a species, but a species group, habitat, or natural community type, such as migratory birds, floodplain forests, or large contiguous grasslands.

When available, we used existing wildlife inventory data and current information on habitat conditions to inform our selection of priority refuge resources of concern for each CFA and refuge unit. This data was often available for CFAs with existing refuge divisions (e.g., Pondicherry and Nulhegan Basin) and for refuge units. However, this data is generally limited to the acres we currently own, and not to the entire CFA located outside the existing refuge division boundary. Where this data was not available, the habitats and wildlife species—and their condition —were analyzed using only coarse-scale information. This included the careful analysis of spatially-explicit habitat data using GIS (Geographic Information Systems), the consultation of local and state experts and conservation plans, and an understanding of forest

disturbance and land use history in New England. This allowed identification of broad habitat types and the selection of "preliminary" priority refuge resources of concern that are associated with habitat type attributes. These preliminary species will be further refined when the Service acquires land within these CFAs. A comprehensive, multi-scale wildlife and habitat inventory will be conducted providing baseline information to further inform priority refuge resources of concern, and provide more detailed habitat prescriptions required within a step-down HMP.

The priority refuge resources of concern for each CFA and refuge unit was chosen from the Connecticut River watershed priority resources of concern list, and based on the following criteria:

(1) Is there a federally threatened or endangered species, a Federal candidate species, a species petitioned for Federal listing or a species mentioned in the refuge's purposes currently present in a CFA or unit (e.g., puritan tiger beetle). If yes, then the species is a priority.

(2) For species whose core range is within the CFA or refuge unit, and management for them will benefit other priority species. If yes to all of these questions, then the species is a priority:

- Is the species distributed throughout the CFA, and/or is the CFA within the core of their breeding/migratory/wintering range?
- Does the CFA provide the habitat to support this species?
- Will this species respond well to management?
- Does the species have the highest ranking, and will management for this species also benefit a suite of species that rely on similar habitat types and structure (e.g., wood thrush, American black duck)?

(3) Does the species have habitat needs that will not be addressed through management of other chosen priority species, and is currently present in a CFA or refuge unit (e.g., blackburnian warbler). If yes, then the species is a priority.

(4) Is there a habitat type within the CFA or refuge unit that is not necessarily being managed for a particular priority species of concern due to the habitat type, small patch size or location, but nonetheless, is important to conserve for its contribution to BIDEH or ecosystem processes and function? If yes, then the habitat is a priority.

Species that met the criteria above, but are also listed in state Wildlife Action Plans, under the International Union for Conservation of Nature and/or are a North Atlantic LCC representative species, then the species was given a higher ranking under criteria number 2. Please see the "Process to Determine CFA Priority Refuge Resources of Concern" table for each CFA and in appendix A of the draft CCP/EIS.

Table B.5 shows the priority refuge resources of concern for the proposed CFAs and existing refuge units by habitat type. This is a comprehensive list of species and is not associated with any particular CFA or refuge unit. The species were selected based on the criteria above, and influenced by the location of the CFA or refuge unit in the watershed, size of the CFA or refuge unit, habitat type and patch size, and species presence. New England cottontail, for instance, is a priority refuge resource of concern in three CFAs in the southern portion of the watershed only. Northeastern bulrush is a federally listed species that occurs in freshwater marshes in one CFA and one refuge unit only in southern Vermont. Please see appendix A in the draft CCP/EIS for priority refuge resources of concern for each CFA.

Habitats are also listed as priority refuge resources of concern because they contribute to BIDEH (see criteria #4). Some of these habitats have been impacted by development, and are now rare in the landscape (e.g., floodplain forest). A summary of existing habitats that contribute to BIDEH is provided in table B.3. Habitats that have been impacted by development, and are in need of restoration are listed in table B.5.

**Table B.5. Priority Refuge Resources of Concern for CFAs by Habitat Type**

| (Preliminary) Priority Refuge Resources of Concern | Habitat Type | Habitat Structure |
|---|---|---|
| Wood thrush | Hardwood forest | Breeding habitat includes contiguous mature forests (80 years old or older) dominated by deciduous tree species, moist soils, a moderate to dense sub-canopy and shrub density, open forest floor and closed canopy (Roth et al. 1996, Rosenberg et al. 2003). |
| Chestnut-sided warbler | | Breeding habitat includes early successional deciduous forested upland and wetland (Richardson and Brauning 1995). |
| American woodcock | | Breeding and roosting habitat includes young deciduous and mixed forests (1 to 20 years old) dominated by aspen and birch, and 3-acre or larger forest openings with 60 percent shrub cover, in proximity to alder wetlands and herbaceous openings (Sepik et al. 1981, Kelley Jr et al. 2008). |
| Black-throated blue warbler | | Breeding habitat includes mature deciduous and mixed deciduous-conifer forests with a shrubby understory (Rosenberg and Hodgman 2000, DeGraaf and Yamasaki 2001, Dobbs et al. 2007). |
| Blackburnian warbler | | Breeding habitat includes mature conifer, and conifer-deciduous forests (80 years or older) (Rosenberg and Hodgman 2000, DeGraaf and Yamasaki 2001, Morse 2004). |
| Canada warbler | | Breeding habitat includes contiguous deciduous, mixedwood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 feet within greater than 30 percent canopy closure, a dense foliar mid-story and well developed shrub layer 7 to 20 feet in height, and moist soils (Lambert and Faccio 2005, Chace et al. 2009). |
| Louisiana waterthrush | | Breeding habitat includes contiguous (250 or greater acres) mature deciduous or mixed-wood forests along medium to high-gradient, first to third-order, perennial streams (DeGraaf and Yamasaki 2001, Mattsson et al. 2009). |
| New England cottontail | | Year-round habitat includes dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within 0.6 miles (1 kilometer) of each other (DeGraaf and Yamasaki 2001, Arbuthnot 2008). |
| Little brown bat<br>Tri-colored bat<br>Northern long-eared bat<br>Eastern small-footed bat | | Caves used for hibernation. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/nesting. Maternity trees (8 to 14 inches diameter at breast height (dbh)) and travel corridors to water are also important (DeGraaf and Yamasaki 2001, Darling Guidelines, unpublished). |
| Bald eagle<br>osprey (breeding and migrating only) | | Breeding, migrating, and wintering habitat includes large bodies of open water with little human disturbance, and large canopy trees or other elevated sites for nesting, perching, and roosting (DeGraaf and Yamasaki 2001). |

| (Preliminary) Priority Refuge Resources of Concern | Habitat Type | Habitat Structure |
|---|---|---|
| Blackburnian warbler | Spruce-fir forest | Breeding habitat includes mature conifer, and conifer-deciduous forests (80 years or older) (DeGraaf and Yamasaki 2001, Morse 2004). |
| Rusty blackbird | | Breeding habitat includes conifer dominated forested wetlands interspersed with shrub swamps and peatlands. Young spruce and fir may be required for nesting (Greenberg and Matsuoka 2010, Matsuoka et al. 2010, Powell et al. 2010). |
| Canada warbler | | Breeding habitat includes contiguous deciduous, mixed-wood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 feet within greater than 30 percent canopy closure, a dense foliar mid-story and well developed shrub layer 7 to 20 feet in height, and moist soils (Lambert and Faccio 2005, Chace et al. 2009). |
| Canada warbler | Hardwood swamps | Breeding habitat includes contiguous deciduous, mixed-wood and coniferous forests interspersed with openings that provide an average overstory tree height of 55 feet within greater than 30 percent canopy closure, a dense foliar mid-story and well developed shrub layer 7 to 20 feet in height, and moist soils (Lambert and Faccio 2005, Chace et al. 2009). |
| | Conifer swamps | |
| American woodcock | Shrub swamps and floodplain forests | Foraging habitat includes alder dominated wetlands in proximity to early successional forests, shrublands and herbaceous openings (Sepik et al. 1981, Kelley Jr et al. 2008). |
| American black duck | | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf and Yamasaki 2001). |
| New England cottontail | | Year-round habitat includes shrub swamps of at least 25 acres that are within 0.6 miles (1 kilometer) of other shrub swamps, and early successional forest patches (DeGraaf and Yamasaki 2001, Arbuthnot 2008). |
| Little brown bat<br>Tri-colored bat<br>Northern long-eared bat<br>Eastern small-footed bat | | Caves used for hibernation. Roosting trees located in forested landscapes clustered in stands of large trees with cavities or loose bark. Cliffs, ledges, talus slopes also important for roosting/nesting. Maternity trees (8 to 14 inches dbh) and travel corridors to water are also important (DeGraaf and Yamasaki 2001, Darling Guidelines, unpublished). |
| American black duck | Freshwater marshes | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf and Yamasaki 2001). |
| Snowy Egret | | Foraging habitat includes shallow pools, freshwater wetlands, and tidal flats within the vicinity of nesting areas (DeGraaf and Yamasaki 2001). |
| Northeastern bulrush | | Year-round habitat includes herbaceous wetlands with seasonally fluctuating water levels (USFWS 2006). |
| American black duck | Peatlands | Breeding and migrating habitat includes herbaceous wetlands, and flooded meadows and shrub-swamps (Longcore et al. 2000, DeGraaf and Yamasaki 2001). |

| (Preliminary) Priority Refuge Resources of Concern | Habitat Type | Habitat Structure |
|---|---|---|
| American woodcock | Pasture/hay/grassland | Roosting habitat includes old fields with scattered tall herbaceous vegetation and/or shrubs. Herbaceous openings such as log landings and pasture used for singing grounds (Sepik et al. 1981, Kelley Jr et al. 2008). |
| New England cottontail | | Year-round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within 0.6 miles (1 kilometer) of each other (DeGraaf and Yamasaki 2001, Arbuthnot 2008). |
| Floodplain communities (restoration) | | *Laurentian-Acadian floodplain forest* occurs along medium to large rivers, and include a matrix of upland and wetland habitats. Floodplain forests, with silver maple are characteristic, as well as herbaceous sloughs and shrub wetlands. Most areas are underwater each spring; micro-topography determines how long the various habitats are inundated. Associated trees include red maple and American hornbeam, the latter frequent but never abundant. On terraces or in more calcium rich areas, sugar maple or red oak may be locally prominent, with yellow birch and ash, black willow is characteristic of the levees adjacent to the channel. Common shrubs include silky dogwood and viburnum. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern-dominated understory in many areas by mid-summer. Non-forested wetlands associated with these systems include shrub-dominated and grass-non-woody vegetation (Gawler et al. 2008). |
| Managed grasslands (large contiguous acreage only) | | These habitat types include ruderal uplands (recently disturbed areas) and old-fields such as abandoned pastures; lands that are intensively managed for cool season grasses, such as Canada rye, redtop, and June grass or warm season grasses, such as switch grass, Indian grass, and blue stem; and hayfields/pastures that are intensively managed for cool season grasses or are active pastures (Gawler et al. 2008). |
| New England cottontail | Old fields and shrublands | Year-round habitat includes pastures, abandoned fields, and dense, young deciduous and mixed forests in patch sizes of 25 acres or more that are situated within1 km of each other (DeGraaf and Yamasaki 2001, Arbuthnot 2008). |

| (Preliminary) Priority Refuge Resources of Concern | Habitat Type | Habitat Structure |
|---|---|---|
| Brook floater | Water | Year-round habitat includes creeks and small rivers, prefers the stable bank conditions afforded by gravel or sandy substrates, and good water quality (Nedeau 2008). |
| Atlantic salmon | | Spawn in cold freshwater moving streams with coarse clean gravel and adequate food and cover. Migrate in large rivers (Kart et al. 2005). |
| Brook trout | | Spawning habitat includes clear, well oxygenated cold water lakes/ ponds/streams with silt-free rocky substrate, abundant cover, vegetated banks, stable temperatures, and stream flow (Kart et al. 2005). |
| Atlantic Sturgeon | | (DeGraaf and Yamasaki 2001) |
| American shad | | Spawn when the water temperature is above 60 degrees Farenheit in shoal area of river and lower reaches of larger tributaries (USFWS 1996). |
| American black duck | | Migrating and wintering habitat includes open water, such as, estuaries, coves or bays with submerged aquatic vegetation, mollusks and crustaceans for foraging (DeGraaf and Yamasaki 2001). |
| American eel | | Migrating and feeding habitat includes lakes, streams and large rivers (USFWS 1996). |
| Dwarf wedgemussel | | Year-round habitst includes creeks and small rivers, prefers the stable bank conditions afforded by gravel or sandy substrates, and good water quality (USFWS 1993, Nedeau 2009). |
| Shortnose sturgeon | | Spawn in slow-moving, 48°F water of large rivers, and feed in fresh and brackish water along the river bottom (USFWS 1996). |
| Blueback herring | | Spawn in fast moving, shallow water when the river temperature is about 58°F (USFWS 1996). |
| Alewife | | Spawn in ponds and slow-moving streams (USFWS 1996). |
| Cobblestone tigerbeetle | | Breeding and wintering habitat includes sparsely vegetated sandy cobble beaches on the banks or upstream side of islands in free-flowing rivers (Pyzikiewicz 2006). |
| Puritan tiger beetle | | Breeding and wintering habitat includes sparsely vegetated or open sandy beaches along large rivers where river flow dynamics restrict woody plant growth (Hill and Knisley 1993). |
| Migratory species (e.g., birds and bats) | River shoreline<br>All habitats in the CFAs and refuge units | The Connecticut River watershed is a major migration corridor. The lower portion of the watershed (CT and MA), and habitats along the main stem, receives higher use by migrating landbirds. As birds move north, they disperse beyond the Connecticut River main stem, becoming more evenly distributed in habitats across the watershed (Smith College 2006). The Connecticut River watershed is also important for migratory waterfowl and bat species. |

The following table (table B.6) identifies high refuge priority habitats for each CFA and refuge unit that will be a priority for active management in the next 15 years. These priority habitats are subject to change once land is acquired within the CFA and a wildlife and habitat inventory has been conducted. Active management will likely not occur within the majority of refuge units, except where federally listed species occur, due to the small acreage and habitat patch sizes (refuge units range between 3 to 285 acres). Therefore, we do not list all refuge units in this table.

**Table B.6. Habitat Priorities at Conte Refuge**

| CFA or Refuge Unit | Priority I Habitats | |
|---|---|---|
| | **Habitat Type** | **Reasons for Ranking** |
| **Whalebone Cove** | Freshwater marsh | Significant acreage in CFA; part of lower Connecticut River tidal wetland system; habitat for American black duck, semipalmated sandpiper, migratory waterfowl, and shorebirds. |
| | Hardwood forest | Diversity of species rely on habitat, including New England cottontail (Federal candidate species), wood thrush, and Louisiana waterthrush, contiguous tract rare in southern portion of watershed. |
| | Shrub swamps and floodplain forests | Small in acreage but part of the tidal wetland system of the lower Connecticut River, New England cottontail, American black duck, American woodcock, and migratory waterfowl. |
| **Scantic** | Floodplain forest (currently agriculture) | Impacted by development/agriculture, uncommon habitat in the Connecticut River watershed; restoration necessary, significant for migrants. |
| | Hardwood swamp | Within the floodplain of the Connecticut River; potential impacts by development/agriculture; benefits migratory species. |
| | Freshwater marsh | Within the floodplain of the Connecticut River; potential impacts by development/agriculture; benefits migratory waterfowl species. |
| **Salmon River** | Hardwood forest | Diversity of species rely on habitat, including New England cottontail (Federal candidate species), wood thrush, and Louisiana waterthrush; and contiguous tract of hardwood forest rare in southern portion of watershed. |
| | Shrub swamps and floodplain forests | Part of lower Connecticut River tidal wetland system; provides habitat for New England cottontail, American black duck, American woodcock, and migratory waterfowl. |
| | Freshwater marsh | Part of lower Connecticut River tidal wetland system; provides habitat for American black duck, other migratory waterfowl, and shorebirds. |
| **Salmon Brook** | Floodplain forest (currently agriculture) | Impacted by development/agriculture; uncommon habitat in the Connecticut River watershed; restoration necessary; significant for migrants. |
| | Grasslands (currently agriculture) | Uncommon contiguous large block of grassland habitat; provides habitat for declining grassland species. |
| | Hardwood swamp | Within the floodplain; large acreage in CFA; potential impacts by development/agriculture; provides habitat for migratory species. |
| **Pyquag** | Floodplain forest (currently agriculture) | Impacted by development/agriculture; uncommon habitat in the Connecticut River watershed; restoration necessary; significant for migrants. |
| | Hardwood swamp | Impacted by development/agriculture; uncommon habitat in the Connecticut River watershed; restoration necessary; significant for migrants. |
| | Freshwater marsh | Impacted by development/agriculture; uncommon habitat in the Connecticut River watershed; restoration necessary; used by migratory waterfowl. |

| CFA or Refuge Unit | Priority I Habitats | |
|---|---|---|
| | **Habitat Type** | **Reasons for Ranking** |
| **Maromas** | Hardwood forest | Contiguous tract rare in southern portion of watershed; connects to other large forest tracts; diversity of species rely on habitat, including wood thrush and Louisiana waterthrush. |
| | Shrub swamps and floodplain forests | Adjacent to Connecticut River, significant in size, American black duck, migratory waterfowl. |
| **Farmington River** | Hardwood forest | Diversity of species rely on habitat including New England cottontail (Federal candidate species), wood thrush, and Canada warbler; contiguous tract rare in southern portion of watershed. |
| | Shrub swamps and floodplain forests | Provides habitat for New England cottontail, American black duck, and American woodcock; large tract in CFA. |
| | Freshwater marsh | Provides habitat for American black duck; large tract in CFA. |
| **Westfield River** | Hardwood forest | Diversity of species rely on habitat including wood thrush, blackburnian, woodcock, and Canada warbler; contiguous tract, undeveloped landscape; connectivity, riparian buffer. |
| | Shrub swamps and floodplain forests | Provides habitat for American woodcock and American black duck. |
| **Mill River** | Floodplain forest (currently agriculture) | Impacted by development/agriculture; uncommon habitat in the watershed; restoration necessary; significant for migratory species. |
| | Hardwood swamp | Within the floodplain of the Connecticut River; potential impacts by development/agriculture; migrants. |
| | Freshwater marsh | Within the floodplain of the Connecticut River; potential impacts by development/agriculture. |
| **Fort River** | Floodplain forest (currently agriculture) | Impacted by development/agriculture; uncommon habitat in the watershed; restoration necessary; significant for migratory species. |
| | Grasslands (currently agriculture) | Uncommon to have a contiguous large block of grassland habitat; declining grassland species. |
| **Dead Branch** | Hardwood forest | Diversity of species rely on habitat including wood thrush, blackburnian, woodcock, and Canada warbler; contiguous tract, undeveloped landscape; connectivity, riparian buffer. |
| | Shrub swamps and floodplain forests | Provides habitat for American woodcock and American black duck. |
| | Freshwater marsh | Within a large wetland complex; provides habitat for American black duck. |
| **Sprague Brook** | Hardwood forest | Diversity of species rely on habitat including wood thrush, blackburnian, woodcock, and Canada warbler; contiguous tract; undeveloped landscape; connectivity. |
| | Shrub swamps and floodplain forests | Part of a larger wetland complex; provides habitat for a diversity of species, including American woodcock, American black duck, rookery. |
| | Freshwater marsh | Part of a larger wetland complex, provides habitat for a diversity of species, including American black duck. |

| CFA or Refuge Unit | Priority I Habitats | |
|---|---|---|
| | **Habitat Type** | **Reasons for Ranking** |
| **Pondicherry** | Spruce-fir | Supports rare boreal species and species of conservation concern; provides forest buffer for numerous streams in CFA; contiguous forest. |
| | Peatlands | Uncommon habitat type in landscape; sensitive habitat, unique plant species; provides habitat for black ducks; surrounds remote ponds. |
| | Shrub swamps and floodplain forests | Part of a larger wetland complex; supports American black duck and American woodcock. |
| **Mascoma** | Hardwood forest | Diversity of species rely on habitat including wood thrush, blackburnian, woodcock, and Canada warbler, contiguous tract, undeveloped landscape; connectivity, riparian buffer. |
| | Shrub swamps and floodplain forests | Part of a larger wetland complex; supports American black duck and American woodcock. |
| | Conifer swamp | Provides riparian buffer; part of a larger wetland complex; supports Canada warbler. |
| **Blueberry Swamp** | Spruce-fir | Supports rare boreal species; provides forest buffer for numerous streams in CFA; contiguous forest. |
| | Shrub swamps and floodplain forests | Large block of shrubland habitat; part of a larger wetland complex, supports American black duck and American woodcock. |
| | Conifer swamp | Large cedar swamp; part of a larger wetland complex; supports unique species and Canada warbler. |
| **Ashuelot** | Hardwood forest | Diversity of species rely on habitat, including wood thrush, blackburnian, woodcock, and Canada warbler; contiguous tract; undeveloped landscape; connectivity, riparian buffer. |
| | Shrub swamps and floodplain forests | Part of a larger wetland complex; supports American black duck and American woodcock. |
| | Freshwater marsh | Part of a larger wetland complex; supports diversity of species, including American black duck. |
| **White River** | Hardwood forest | Diversity of species rely on habitat, including wood thrush, chestnut-sided warbler, and bats; contiguous tract; undeveloped landscape; connectivity; riparian buffer. |
| **West River** | Hardwood forest | Diversity of species rely on habitat, including wood thrush, blackburnian, woodcock, and Canada warbler; contiguous tract; undeveloped landscape; connectivity; and riparian buffer. |
| | Shrub swamps and floodplain forests | Large block in CFA; supports American black duck and American woodcock. |
| | Freshwater marsh | Large block in CFA; diversity of species; potential for northeastern bulrush; supports American black duck. |

| CFA or Refuge Unit | Priority I Habitats | |
|---|---|---|
| | **Habitat Type** | **Reasons for Ranking** |
| **Ottauquechee** | Hardwood forest | Diversity of species rely on habitat, including wood thrush, chestnut-sided warbler, and bats; contiguous tract; undeveloped landscape; connectivity; riparian buffer. |
| **Ompompanoosuc** | Hardwood forest | Diversity of species rely on habitat, including wood thrush, blackburnian, woodcock, and bats; contiguous tract; undeveloped landscape; connectivity; riparian buffer. |
| | Shrub swamps and floodplain forests | Supports American black duck, bats, and American woodcock. |
| | Freshwater marsh | Supports American black duck. |
| **Nulhegan Basin** | Spruce-fir | Supports rare boreal species and species of conservation concern; forest buffer for numerous streams in CFA; contiguous forest; connectivity. |
| | Shrub swamps and floodplain forests | Supports American black duck and American woodcock. |
| | Peatlands | Uncommon habitat type in landscape; sensitive habitat; unique plant species; black ducks; surrounds remote ponds. |
| **Putney Mountain Unit** | Freshwater marsh | Northeastern bulrush, a federally listed species, occurs in wetlands. |
| **Deadman's Swamp Unit** | Shoreline/beach | Puritan tiger beetle, a federally listed species, occurs along the Connecticut River. |

From the onset of the CCP process, wildlife partners from the states of Vermont, New Hampshire, Massachusetts, and Connecticut have been involved with the selection of priority resources and the development of refuge goals and objectives. Throughout the process, differing agency goals were apparent. However, participative planning with professional wildlife stakeholders is useful to address issues that may otherwise result in controversy. The additional time and effort that is needed to identify priority habitats that offer commonality with partners' goals is worthwhile and results in more broadly accepted decisions (Sportza 1999).

The planning team determined the most appropriate biological goals and objectives for the refuge based on Refuge System policy, and then found commonalities with the state partners in meeting state wildlife habitat goals. The freshwater wetlands and resources of concern that were identified as priorities for the refuge, overlap with state wetland goals. The mixed spruce-fir/northern hardwood forest contributes to state goals for the priority landbird species that were chosen, as well as provide habitat for other state species of concern. The mixed forest will provide connectivity of habitats for mammals with large home ranges and protection of white-tailed deer wintering areas. Many State Species of Greatest Conservation Need are listed as associated species or species that are associated with the habitat type and/or will benefit from all or a portion of the habitat structure associated with the refuge priority resource of concern. These species are listed with the priority refuge resources of concern to provide a broader scope of species conservation within each CFA. See appendix A of the draft CCP/EIS for the compilation of priority refuge resources of conservation concern and associate species for each CFA and refuge unit.

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## Appendix C

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*Nulhegan Basin Division*

# Land Protection Plan


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III. Project Relationship to Service Directives and Initiatives

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V. Partnerships Important for Project Design and Implementation

VI. Implementing the Proposed Land Protection Strategy

VII. Project Costs and Funding

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# I. Introduction

## Overview

This draft Land Protection Plan (LPP) provides detailed information regarding a proposal by the United States (U.S.) Fish and Wildlife Service (Service; we, our) to expand land protection authority within the legislative boundary of the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge; refuge). The legislative boundary of the refuge encompasses the entire Connecticut River Watershed (watershed) including land in Connecticut, Massachusetts, New Hampshire, and Vermont (map C.1). Current refuge-owned lands include 35,921 acres as of October 2013[1]. There are nine established divisions and eight units depicted on map C.1. Divisions are larger and consist of many individual acquired parcels; units are smaller and typically include only one or two acquired parcels.

Our proposal is to expand our authority to protect land for Conte Refuge's from approximately 97,830 acres (current authority) up to approximately 197,296 acres total. This represents an expansion of approximately 99,466 acres. Over the duration of this project, we propose that approximately 65 percent (128,242 acres) of the entire 197,296-acre project area be acquired by the Service in fee title from willing sellers. The remaining 35 percent (69,054 acres) would involve less than fee title acquisition, such as conservation easements. However, the actual split between fee and easement will be heavily influenced by the preferences of the landowners. This proposal to expand the refuge is part of the Service-preferred alternative (alternative C) in the draft comprehensive conservation plan and environmental impact statement (CCP/EIS) for Conte Refuge. This LPP is included in the draft CCP/EIS as appendix. The Service's Director will make a decision to approve or disapprove this administrative increase in acquisition authority based on the information in this plan.

The overarching goal of this LPP is to permanently protect areas of significance to Federal trust resources while also working with our partners to ensure that diversity and connectivity in area (size), latitude, elevation, aspect, process, and landform is represented and appropriately connected in the conserved lands network in the watershed. Collaborating with our partners to achieve such a network will sustain representation, redundancy, and resiliency of species, habitats, and ecosystems within the watershed, and thereby promote a landscape that can better adapt and remain viable despite anticipated future climate and land use changes.

In this document, we incorporate the information required by Service policy for a refuge expansion proposal, as well as additional information on how the proposal meets other Service initiatives and directives. Specifically, we detail how the project proposal:

- Adheres to all four principles of Strategic Habitat Conservation (SHC) (*http://www.fws.gov/landscape-conservation/shc.html*; accessed April 2015).
- Benefits the conservation targets identified in the Service's Strategic Growth Policy for the National Wildlife Refuge System (Refuge System); specifically, federally listed threatened and endangered species, migratory birds, and waterfowl (*http://www.fws.gov/policy/602fw5.html*; accessed January 2015).
- Supports the Connecticut River Watershed Landscape Conservation Design pilot project (Connecticut River Watershed LCD); a collaborative project involving over 30 conservation partners in the watershed to identify strategic areas for conserving wildlife and habitats (*http://northatlanticlcc.org/groups/connecticut-river-watershed-pilot*; accessed January 2015).
- Uses representative (e.g. also referred to as "surrogate") species to identify specific contributions to conserving other important habitat and species of conservation concern in the watershed (*http://www.fws.gov/landscape-conservation/selecting-species.html*; March 2015).
- Addresses anticipated climate change and land use impacts and supports the Services' strategic plan for addressing climate change using adaptation, mitigation, and engagement strategies (*http://www.fws.gov/home/climatechange/strategy.html*; accessed March 2015).

[1] Due to the refuge's active acquisition program, it has been challenging to continuously update the maps and analysis in the draft CCP/EIS. 2014 acquisitions include a new division in New Hampshire (Mascoma River Division) and two new units in Massachusetts (Fannie Stebbins Unit and Hatfield Unit).

*Map C.1. Existing Refuge Lands and Other Conserved Lands in the Connecticut River Watershed (as of October 2013)*

- Supports the Service's Urban Refuge Initiative (*http://www.fws.gov/urban/index.php*; accessed January 2015).
- Complements and reinforces conservation partners' land protection actions and conservation priorities in the watershed; including supporting State Wildlife Action Plans (State WAPs).
- Helps meet public interest in increasing compatible, wildlife-dependent recreational and educational opportunities in the hundreds of communities in the watershed.

### General Description of the Connecticut River Watershed

The watershed is a microcosm of the Northeast Region. It is home to about 2.4 million people in 396 communities spanning rural, sparsely populated areas in the north, to more developed areas in the south. Map C.2 depicts urban areas in the watershed. The area has a rich cultural history, steeped in traditions of a working landscape based on forestry, agriculture, and the manufacturing industry.

As the Connecticut River (river) traverses its 410-mile length from the Canadian border to Long Island Sound, the river encounters dramatic changes in elevation, gradient, and vegetation. The watershed rises from sea level where the river meets the Long Island Sound to the highest alpine elevation in New England. The river predominantly travels from north to south, dropping about 2,600 feet in elevation along its length. Near its origins in the Northeast Kingdom of Vermont, the Connecticut Lakes area of New Hampshire, and Canada, the watershed includes mountains with elevations exceeding 3,000 feet. In these northern environs, the river is a narrow, swift, cold water stream that falls some 900 feet in 30 miles, the sharpest drop within its profile. At its confluence with Long Island Sound, the river's tidal influences provides habitat for a completely different complement of flora and fauna. Here, the river offers significant opportunities within the refuge boundary to prepare for sea level rise, allowing for climate change adaptation; namely, the landward migration of tidal (salt, brackish, and fresh) wetlands and other coastal habitats.

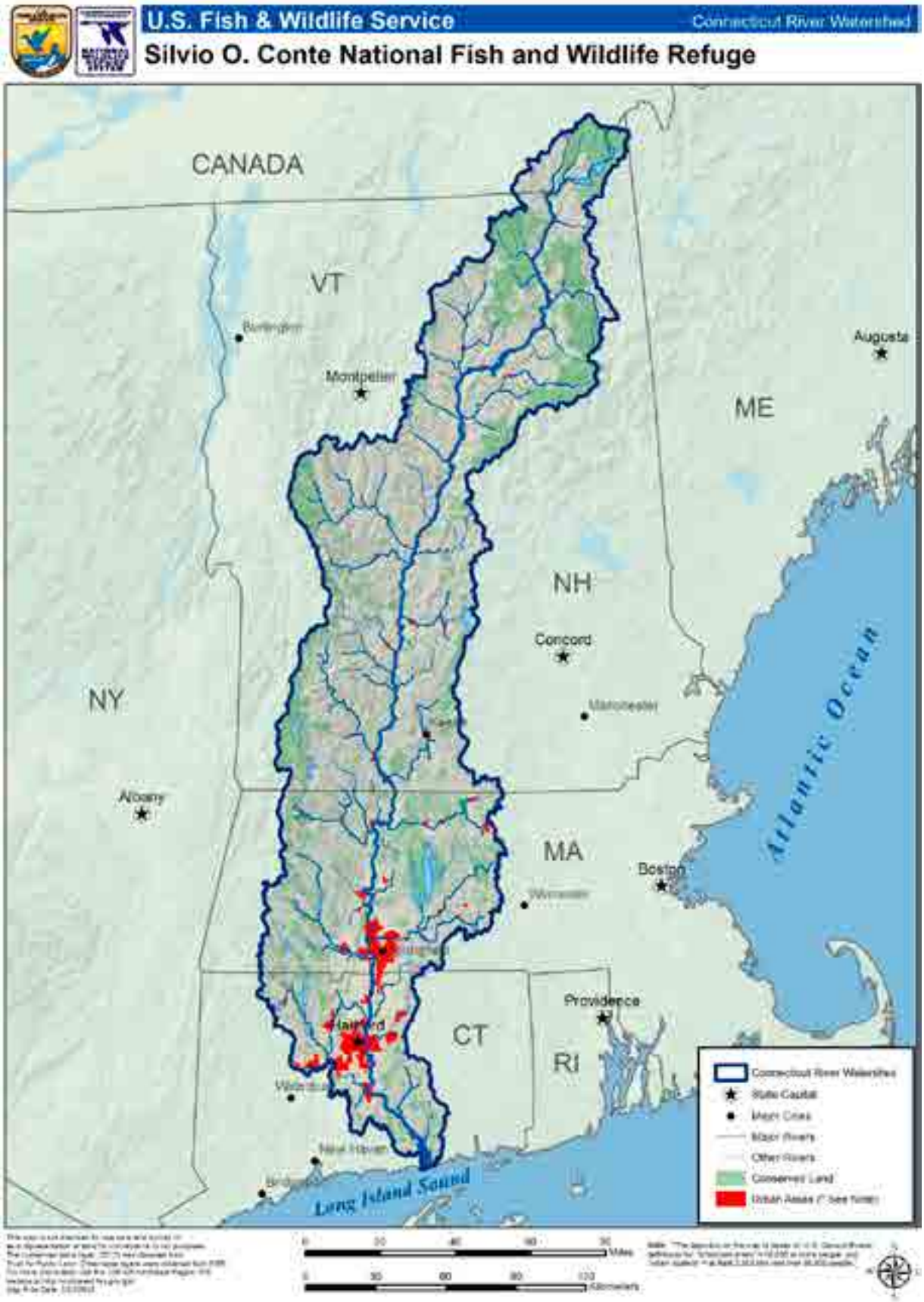
The watershed is approximately 80 percent forested, 12 percent agricultural, 3 percent developed, 3 percent wetland, and 2 percent water. Diverse habitats in the watershed include:

- Floodplain forests and other riparian habitats valuable to migrating songbirds, waterfowl, and many other species of plants and animals.
- Sandplains, old field grasslands, shrublands, and agricultural fields valuable to grassland-nesting birds and other early successional species of conservation concern.
- A variety of forest types, including large areas of relatively unfragmented northern hardwood and conifer forest types, valuable to nesting migrant birds and many other plant and animal species.
- Riverine habitats valuable to migratory fish, other native resident fish, freshwater mussels, and other aquatic species.
- Internationally important (e.g. Ramsar-designated) tidal wetlands.

The most common forests are hardwood dominant maple-beech-birch to the north and oak-hickory to the south, with a transitional forest consisting of a blend of the two types found in between. These forests often cloak the gently sloping rich organic soils along hills and mid-elevation ranges of mountain sides. Softwood dominant forests generally occur in high elevations, low wet depressions, and well-drained sandy soils with spruce-fir abundant in the north and eastern hemlock, and red and white pine more common to the south.

The watershed contains a diverse mix of wetlands. Conifer wetlands and bogs are most common in the north. Beaver flowages are the most widespread wetlands, occurring throughout the watershed. Dams and other river barriers interrupt natural flow regimes, creating impounded aquatic habitats in once free flowing rivers and fragmenting access to fish spawning grounds that once extended to tributaries throughout the watershed. However, there are no barriers to aquatic species passage and migration until Holyoke, Massachusetts, which is well above the head of tide in the vicinity of Hartford, Connecticut.

*Map C.2. Urban Areas in the Connecticut River Watershed*



Historically, shrubs and grasslands were abundant, but have diminished substantially following the abandonment of farms during the 20th century. Today, open habitats are typically associated with old beaver flowages, hay fields, pasture, croplands, and other agricultural enterprises.

Urbanization in the watershed has been most pronounced in Massachusetts and Connecticut, although communities dot the river along its entire course. Approximately 3 percent of the watershed has been developed for residential, municipal, commercial, or other purposes.

The watershed supports a rich array of wildlife. Fifty-nine species of mammals live within the watershed year-round, including the federally listed lynx and northern long eared bat, as well as bobcat, black bear, white-tailed deer, moose, coyote, fisher, other forest bats, rabbits and hare, and a variety of other small mammals. Twenty-seven species of ducks, geese, and swans, 15 species of shorebirds, and 24 other water-dependent bird species such as rails, grebes, and herons, use the watershed for breeding, wintering, or migration. The watershed is also host to 181 passerine and raptor species. Of these, 88 are neotropical migrants using the watershed for breeding; 77 are residents breeding and wintering, and 16 are winter residents that migrate to the watershed from the north. Reptiles include 9 species of turtles and 16 snakes. Amphibians include 12 species of salamander, and 7 species of toads and frogs.

The watershed also supports a wide diversity of fish species. Included are 33 native or indigenous freshwater species; 35 nonindigenous freshwater fish; 11 anadromous fish; 1 catadromous fish; 15 amphidromous fish; and, 48 saltwater fish. The northern reaches of the river, in the Connecticut Lakes region, provide habitat for lake and brook trout and land-locked salmon. American shad have impressive runs in the river, as do sea lamprey and American eel. Shortnose sturgeon, a federally listed species, occurs up to the Turner's Falls Dam in Massachusetts. Striped bass are in abundance below the Holyoke Dam, but are also known to pass upstream of Vernon Dam in much smaller numbers. The mid-section of the river also supports pickerel, largemouth and smallmouth bass, northern and walleye pike, and a variety of panfish. Summer flounder are found at the mouth of the river. Carp, suckers, and catfish are also present in many areas.

### Conte Refuge Establishment History

The refuge was named in honor of the late U.S. Congressman Silvio O. Conte of Massachusetts, who dreamed of conserving the watershed, in part, by creating a new national wildlife refuge. He also envisioned Federal, State, and non-governmental conservation organizations working collaboratively to protect threatened and endangered species and conserve the rich diversity of fish, wildlife, and plants throughout the watershed. He was a strong advocate of using sound science to inform and promote conservation action, while also supporting environmental education, outdoor recreation, and traditional natural resource-based economic endeavors within this large and integrated working landscape.

Congress passed the Silvio O. Conte National Fish and Wildlife Refuge Act (Conte Refuge Act) in 1991 to initiate making Congressman Conte's dream a reality. Reflecting his foresight and vision, the Conte Refuge Act emphasizes collaborative, landscape-scale conservation within the watershed, as well as developing science centers, and promoting environmental education, outdoor recreation, forestry, and farming.

The Conte Refuge Act legislated a refuge boundary that encompasses the entire 7.2 million-acre watershed, spanning the entire length of the 410-mile river (map C.1). Conte Refuge was authorized by a Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) produced by the Service in 1995. The refuge was established on October 3, 1997 through a donation to the Service of the 3.8-acre Third Island, located in Deerfield, Massachusetts, by the Connecticut River Watershed Council. The 1995 FEIS/ROD, and subsequent National Environmental Policy Act (NEPA) compliant amendments to the refuge acquisition program, authorized acquisition of 97,830 acres allocated within 65 Special Focus Areas (SFAs) distributed throughout the watershed. As of October 2013, approximately 35,921[2] of those acres are under Service stewardship and managed as part of the refuge and the larger conservation lands mosaic (map C.1). In total, just over 1.8 million acres within the watershed is in some form of conservation (map C.1).

### Refuge Purposes, Mission, Vision, and Goals

The refuge purposes were legislatively mandated. The refuge mission and vision statements, and the refuge goals, were developed as part of the draft CCP/EIS planning process. The refuge purposes, mission, vision, and goals are presented below.

[2] As of this May 2015 publication date, Conte Refuge has grown to 36,942 acres. This number will continue to grow because the refuge is a land protection priority for the Northeast Region.

**Legislated Purposes**

The Conte Refuge Act of 1991 (Public Law 102-212) authorizes the following refuge purposes:

- Conserve, protect, and enhance the Connecticut River Watershed populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.

- Protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973, as amended.

- Conserve, protect, and enhance the natural diversity and abundance of plant, fish, and wildlife species and the ecosystems upon which these species depend within the refuge.

- Restore and maintain the chemical, physical, and biological integrity of wetlands and other waters within the refuge.

- Fulfill the international treaty obligations of the U.S. relating to fish and wildlife and wetlands.

- Provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access to the extent compatible with the other refuge purposes.

**Mission Statement**

"Work in partnership with others to inspire stewardship, magnify achievements, and celebrate shared successes that enhance, nurture, and voluntarily and collaboratively protect the natural, cultural, and sustainable economic richness of the Connecticut River and its watershed as a New England working landscape composed of public and private land."

**Vision Statement**

"The Connecticut River is treasured by all for its majesty and significance in supporting life along its winding 410-mile passage through urban and rural communities in New Hampshire, Vermont, Massachusetts, and Connecticut. Working with our partners, we are inspired to protect and enhance the natural and cultural richness throughout the watershed, especially on lands and waters entrusted to our agency as the Silvio O. Conte National Fish and Wildlife Refuge.

Together with our partners, we design, support, and implement strategic conservation actions across the watershed, and communicate conservation needs and successes through extensive outreach and education programs. On refuge lands, we offer visitor programs and activities that promote an appreciation of the Connecticut River Watershed as an intact, interconnected, and healthy ecosystem. Visitors respond to this greater awareness by becoming active stewards of the watershed's natural and cultural resources. Our actions exemplify the Service's vital role in conserving the Connecticut River Watershed and the refuge's important contribution to the mission of the National Wildlife Refuge System."

**Refuge Goals**

Four refuge goals were collaboratively developed with partners during the CCP planning process to help achieve the vision, mission, and legislated purposes for the refuge:

<u>Habitat and Species Conservation</u>

- Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River Watershed in an amount and distribution that sustains ecological function, supports healthy populations of native fish, wildlife, and plants, especially Federal trust species of conservation concern, in anticipation of the effects of climate, land use, and demographic changes.

<u>Education, Outreach, and Interpretation</u>

- Inspire residents and visitors to actively participate in the conservation and stewardship of the exceptional natural and cultural resources in the Connecticut River Watershed, and promote a greater understanding and appreciation of the role of the Silvio O. Conte National Fish and Wildlife Refuge in conserving those resources.

Recreation

- Promote high quality, public recreational opportunities in the Connecticut River Watershed that are complementary between ownerships and provide regional linkages, with emphasis on promoting wildlife-dependent activities that connect people with nature in the outdoors

Partnerships

- Enhance the conservation, protection, and stewardship of natural and cultural resources, and promote wildlife-dependent recreation, throughout the Connecticut River Watershed by initiating, supporting, and promoting partnerships with other Federal, State, and local governments, Tribal governments, and private organizations.

## II. Project Planning and Design

### Project Planning Overview

In 2006, we initiated public and partner scoping as part of the Service's planning process to develop a CCP (*http://www.fws.gov/northeast/planning/index.html;* accessed March 2015). During scoping, we received significant public and partner support for a refuge expansion. Some of that feedback included maps and data depicting recommendations for areas to consider. Over 750,000 acres were identified by our partners. With preliminary information regarding benefits to Federal trust resources, we requested authority from our Director to further evaluate some of these recommendations. In November 2011, the Service's Director approved a Preliminary Project Proposal to allow us to pursue detailed planning for a potential increase in refuge acquisition authority of up to 200,000 acres total in the watershed, approximately twice the size of our existing authority.

We began detailed planning by evaluating the effectiveness of the 1995 FEIS refuge land acquisition strategies where 65, often small SFAs, primarily tied to federally listed species, wetlands, and rare plant communities, were identified for acquisition. Many of the acquired parcels to date may contain breeding habitat for federally listed or rare species and, thereby, offer an important, immediate, and direct level of protection for those site specific individual populations; however, over the long term, the distribution of small, scattered parcels does not consider other important factors. For example, this strategy does not consider species' travel or movement corridors. Nor does it necessarily provide for important habitats used by the species outside of breeding season. It also does not adequately resolve threats on adjacent or nearby lands, or support opportunities to restore habitats on a meaningful scale or in a sustainable way. Finally, this strategy does not address the potential impacts from climate or land use changes. Each of these considerations is important to address when considering the long-term viability of species populations and habitats in the watershed.

Administratively, we have found that managing small, scattered parcels is also financially and operationally inefficient when considering resource investments and cost per acre. The resources expended to get staff and equipment to these sites to manage small units (e.g., post boundaries, brush vegetation, mow fields, conduct surveys, maintain trails and facilities, resolve encroachments, and conduct law enforcement) is much less efficient on a cost per acre basis compared to larger, more contiguous and resilient parcels where more acres can be treated on a single trip. We also believe this acquisition strategy will not be effective in protecting species and crucial habitats over the long term, and unnecessarily limits our ability to practice strategic habitat conservation and fulfill the refuge's purposes.

In our judgment, due to the biological, ecological, and administrative concerns we raise above, the SFA strategy for refuge land acquisition is not in the best interest of the American public because taxpayer's monies can be used more efficiently and effectively. Furthermore, this approach restricts our flexibility in addressing other factors necessary for conserving Federal trust species on a larger landscape and regional basis.

Our current project proposal adjusts the 1995 FEIS's land protection objectives and no longer pursues a "checkerboard pattern of ownership", including the SFAs with "many small scattered sites" (1995 FEIS, Appendix 2-1 Land Protection Plan). We redirected our focus to strive for larger, more contiguous areas to protect a broader array of Federal trust resources while also providing more flexibility and capability to adapt to climate and land use changes on the landscape.

Throughout the planning process, relevant new information frequently became available which created both challenges and opportunities. Forward momentum was often intentionally slowed as new data was considered for our proposal strategy. We spent 2012 and 2013 evaluating the best available information and working with

partners to refine our refuge proposal. Beginning in 2014, we also participated in a collaborative partnership planning process to develop a landscape conservation design for the watershed. We describe that effort in more detail below under "Relationship of Project to Connecticut River Watershed Landscape Conservation Design (LCD)." The results of that planning effort, including the principle product of a strategic core-connector network design, also informed and reinforced our project proposal, approach, and understanding of our value and role within the larger conservation landscape.

The following LPP project goals were developed to provide a framework for our analysis:

**Conserve Priority Conservation Targets**
To this end, we collaborated with a diversity of public and private stakeholders, including the four State natural resources agencies in the watershed and our Federal agency partners, to identify priority species and habitats of conservation concern. These entities helped us compile known information on Federal trust resource occurrences and associated important habitat areas. In particular, we targeted our interests on habitats supporting federally listed species, migratory birds in decline, and waterfowl as directed by the Refuge System's Strategic Growth policy. Each of the States, and several conservation organizations, identified their priority focal areas for additional conservation, and we discussed with them throughout the planning process ways to complement their land protection and management efforts as we developed and refined our areas of consideration. We also consulted the Connecticut River Watershed LCD final decision on a strategic core-connector land protection network in assessing our final proposal. Attachment III provides an example of how several of our proposed Conservation Focus Areas (CFAs) overlap with the final LCD core-connector network. A shared priority among our partnership is to maintain a well-distributed diversity of habitat types in the watershed to support healthy populations of native fish and wildlife that will be resilient to anticipated changes in climate and land uses.

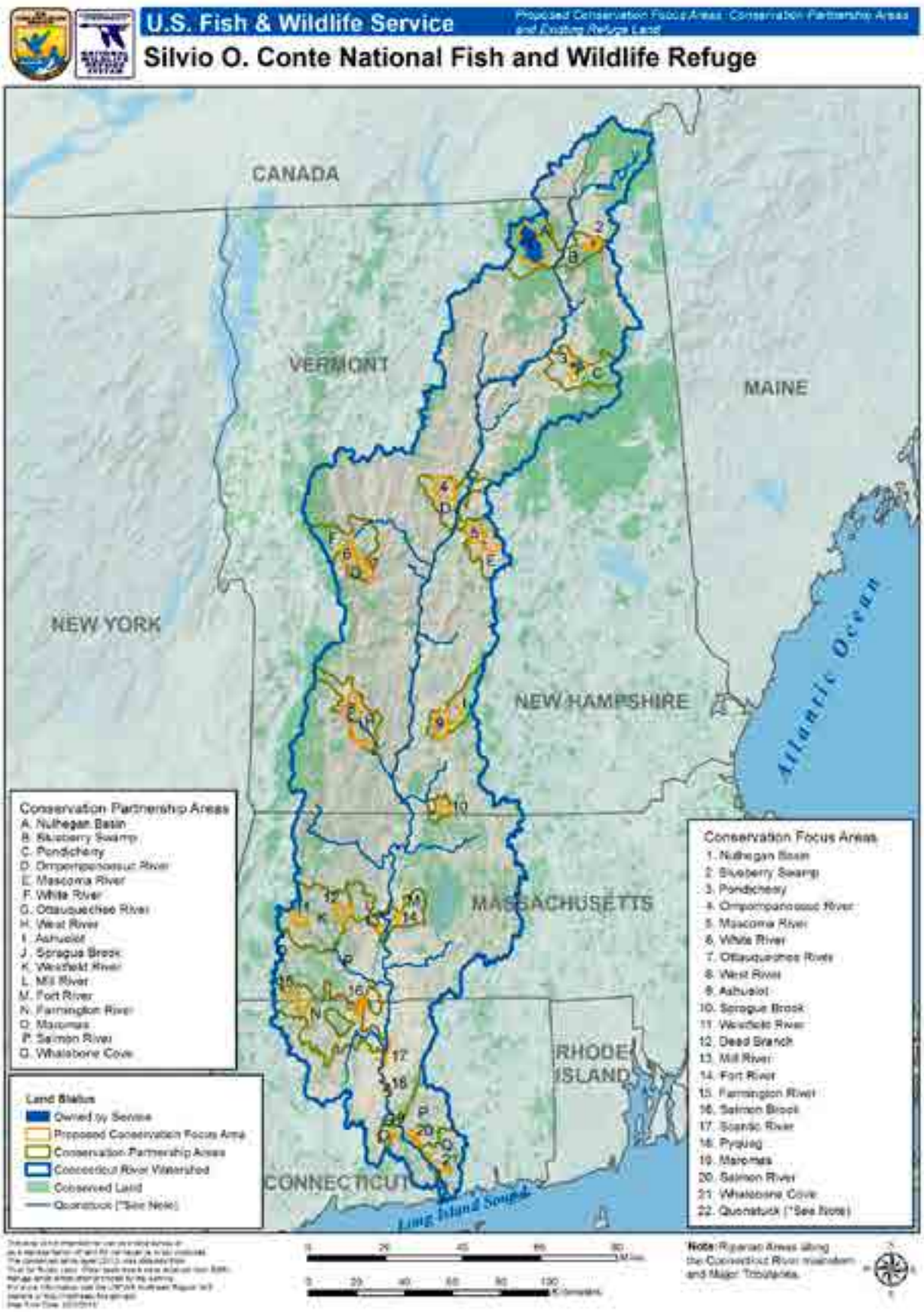
**Provide Habitat Connections**
We worked with our partners to identify key habitat connections for Federal trust species and other respective State species of concern within the existing and potential conservation landscape. Collectively, we considered habitat diversity and connectivity in area (size), elevation, latitude, aspect, process, and landform. In addition, we also identified areas that would serve as important connections for protecting biological integrity and ecosystem health, and contribute to ecosystem services (e.g. water quality and quantity, and carbon sequestration). The Connecticut River Watershed LCD core-connector network design became a valuable tool for evaluating and verifying our consistency with this goal in our proposal.

**Incorporate Adaptation Strategies for Predicted Climate and Land Use Changes**
We also considered how connections to other existing conserved lands would promote representation, redundancy, and overall resiliency within the watershed knowing these factors would help provide flexibility in the landscape for species and habitats to adapt to impacts from land use, demographic shifts, and climate changes. We sought the best available science to evaluate opportunities to address climate change. In addition, to the Connecticut River Watershed LCD core-connector network product, we compared that project's modeling results depicting an index of ecological integrity, climate persistence, and urban growth across the watershed (*http://www.umass.edu/landeco/research/dsl/dsl.html*; accessed April 2015). We also considered The Nature Conservancy (TNC) resiliency mapping (*http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/default.aspx*; accessed May 2014), a considerable amount of digitally available species and ecosystem data from the four watershed States' natural resource agencies, and other sources of resource data that is publically available.

We also considered how existing and proposed refuge lands could benefit the near- and long-term desirable outcomes for species migration, emigration, and potential adaptation opportunities under predicted land use and climate changes. For example, the barrier-free segment near the river's mouth creates opportunities, over time, for the landward migration of the coastal wetland complex from the Long Island Sound which can be enhanced through the strategic placement of protected land in this reach of the river.

**Project Design**
*Conservation Partnership Areas (CPAs)*
We collaborated with State, Federal, and non-governmental partners to define and delineate Conservation Partnership Areas (CPAs) within the watershed. In response to their input, we delineated 17 CPAs that comprise approximately 1.2 million acres, or about 17 percent of the entire watershed (map C.3). CPAs are

*Map C.3. Proposed Conservation Partnership Areas and Conservation Focus Areas*



generally defined along a subwatershed boundary that includes one or more 12-digit U.S. Geological Survey (USGS) hydrologic units (HUCs) (*http://nh.water.usgs.gov/projects/ct_atlas/water_wsheds_huc.htm*; accessed August 2013). Watershed boundaries are used because of their familiarity to our partners, their significance to both aquatic and terrestrial ecological systems, and because they are a relevant context for describing ecosystem services important to watershed communities.

CPAs are essentially large areas of mixed ownership where concentrations of Federal trust and other resources of conservation concern occur. They may include important working forests and farms, or provide key connections between protected areas of high conservation, socio-economic, and outdoor recreational value. CPAs are areas where our partnership agreed that refuge staff should focus leadership, resource expenditures and expertise, and support conservation efforts by our partners.

Specifically, CPAs identify where our refuge staff would plan to focus their limited resource expenditures (e.g. staff, funds, equipment) and help facilitate the work of our partners consistent with our goals and objectives for the watershed and refuge purposes. In many instances, refuge and other Service staff would serve a supporting role in partner-led efforts on other ownerships. It is not assumed that refuge staff would take the lead role in all conservation activities in CPAs. Grants, private lands programs and coordination, technical forums and information exchanges, shared equipment, cooperative management agreements, leases, various conservation easements, and fee title acquisition, would all be actions to consider as we work in partnership with others. In particular, we would facilitate landowner enrollment in State and Federal voluntary and incentive based conservation programs that protect and improve wildlife habitat, protect working farms and forests, support public access for outdoor recreation, provide related and sustainable economic opportunities, and support other land uses that would benefit conservation. The Connecticut River Watershed LCD core-connector network design will be especially helpful in our strategic partnership approach within the CPAs, as well as elsewhere within the watershed.

*Conservation Focus Areas (CFAs)*
We also worked with our partners to delineate 22 CFAs, which are imbedded in CPAs (map C.3). The CFAs range in size from 1,662 acres (Fort River Division, Massachusetts) to 32,541 acres (Nulhegan Basin Division, Vermont). CFAs are areas where the Service would focus land acquisition efforts for Conte Refuge (fee title and easement) to make important contributions to the priority conservation targets established by the Refuge System's Strategic Growth Policy and to help achieve other Service goals and objectives.

We believe that concentrating refuge ownership into 22 large, biologically intact, and ecologically resilient CFAs is significantly more effective than the 65 scattered, small SFAs proposed in the 1995 FEIS. Nevertheless, most of the CFAs proposed in this LPP include many of the original SFAs, or accomplish much of the intended outcomes of those that were omitted. Ten of the 1995 SFAs were the basis for establishing existing refuge divisions which we propose to enlarge further in this LPP. Seven additional SFAs are identified in the 1995 FEIS and are expanded as CFAs in our proposal. These 7 CFAs do not currently exist as refuge divisions since no first parcel has been acquired. Once land is acquired for the refuge within a CFA, we would administratively refer to it as an established refuge division. The remaining 5 CFAs in our proposal were not originally identified as SFAs in the 1995 FEIS, but their contribution to conserving Federal trust resources warranted their inclusion. Lands already in permanent conservation ownership, and/or which are highly productive agricultural lands, are not targeted for acquisition.

The following three criteria were primarily used to delineate and refine specific areas for inclusion in CFAs:

- Contributes to the recovery of federally listed species, including the protection of critical, occupied, or historic habitat for those species.

- Contributes to sustaining populations of migratory birds in decline by protecting breeding, migration, and wintering habitat.

- Contributes to sustaining populations of waterfowl identified as priority species in the North American Waterfowl Management Plan (NAWMP) and Atlantic Coast Joint Venture (ACJV) Implementation Plan.

- Contributes toward the refuge purposes legislated by Congress in the Conte Refuge Act of 1991.

Other criteria used to delineate and refine CFAs were:

- Protects and enhances habitat connections (including size, latitude, elevation, and aspect) for terrestrial and aquatic species to provide vital habitat, and effective areas for movement, migration, and natural processes to promote potential emigration that could complement other wildlife adaptation strategies to offset the expected effects of climate and land use changes.

- Contributes to clean water, clean air, floodplain protection, and maintaining biodiversity and ecosystem health, and addresses threats to those ecosystem services.

- Contributes to the protection and restoration of species and habitat types considered rare, imperiled, or exemplary.

- Contributes to conserving our Federal trust resources by strategically protecting important aquatic and upland habitats in an amount and distribution that promotes habitat representation, resiliency, and redundancy.

- Facilitates the implementation of priority actions of the North Atlantic LCC, State WAPs, and other high priority plans and initiatives.

- Facilitates the implementation of the Connective River Watershed LCD project, including the protection of core areas or their connectors within the existing 1.8 million-acre conservation mosaic.

- Complements and anticipates partners' planned contributions to the current and future conserved lands network.

- Improves administrative efficiencies by delineating a boundary that is more accessible and operationally efficient, following prominent features to reduce impact from adjacent uses, promote access and visibility of refuge lands, and conserve operational funding through reductions in maintenance and administrative costs.

- Assumes Service acquisition from willing sellers within these CFAs over time as lands become available, there is an agreement in terms and price, and land acquisition funding is available.

In general, each CFA includes a core biological area that is based on the needs of identified priority resources of conservation concern using current data obtained from States and other organizations. For each individual CFA, we identify the priority resources of concern that would guide future management under Service ownership (re: appendix A in the draft CCP/EIS). We also used the analysis and results of the Connecticut River Watershed LCD core-connector network to further evaluate and affirm whether areas we identified are strategic for conserving priority species, their habitats, and diverse ecosystems across the watershed. Table 1 summarizes the priority wildlife and fish species that occur in the watershed that will benefit from our proposal. Attachment III provides an example of how the Connecticut River Watershed LCD core-connector network aligned with our CFAs.

**Table C.1. Priority Wildlife and Fish Species Occurring in the Connecticut River Watershed Benefiting from the Conte Refuge Land Protection Project Proposal**

| Priority Species of Concern (*NALCC representative species are in bold) | NALCC[1] | BCC (BCR 30)[2] | BCC (BCR 14)[2] | Federally Threatened and Endangered Species | Petitioned for Federal Listing[3] | Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013 | Listed in Refuge Purposes | BCR 30[4] | BCR 14[4] |
|---|---|---|---|---|---|---|---|---|---|
| **Alewife** | x | | | | | x | x | | |
| **American bittern** | | x | x | | | | | M | M |
| **American black duck** | x | x | x | | | | x | HH | HH |
| **American eel** | | | | | x | x | | | |
| **American oystercatcher** | x | x | | | | | | HH | M |
| American redstart | | | | | | | | | HR |
| **American shad** | x | | | | | x | x | | |
| **American woodcock** | x | x | x | | | | | HH | HH |
| Atlantic sturgeon | | | x | | | x | | | |
| Bald eagle | | x | x | | | | x | M | M |
| Baltimore oriole | | | | | | | | HR | |
| **Bicknell's thrush** | x | | x | | x | | | H | HH |
| **Black-and-white warbler** | | | | | | | | HR | |
| Black-billed cuckoo | | | | | | | | | HR |
| **Blackburnian warbler** | | | | | | | | | HR |
| Black-throated blue warbler | | | | | | | | | HR |
| Black-throated green warbler | | | | | | | | | HR |
| Blueback herring | | | | | | x | x | | |
| **Blue-winged warbler** | x | x | x | | | | | HH | H |
| **Bobolink** | x | | | | | | | | |
| Boreal chickadee | | | | | | | | | HR |
| Broad-winged hawk | | | | | | | | HR | |
| Brook floater | | | | | x | | | | |
| **Brook trout** | x | | | | | x | | | |
| **Brown thrasher** | | | | | | | | HR | |

| **Priority Species of Concern (*NALCC representative species are in bold)** | **NALCC[1]** | **BCC (BCR 30)[2]** | **BCC (BCR 14)[2]** | **Federally Threatened and Endangered Species** | **Petitioned for Federal Listing[3]** | **Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013** | **Listed in Refuge Purposes** | **BCR 30[4]** | **BCR 14[4]** |
|---|---|---|---|---|---|---|---|---|---|
| **Bufflehead** | | x | | | | | | H | |
| Canada goose, Atlantic | x | x | | | | | | HH | |
| Canada goose, north Atlantic | | x | x | | | | | H | H |
| Canada warbler | x | | x | | | | | M | HH |
| **Chestnut-sided warbler** | | | | | | | | | HR |
| Chimney swift | | | | | | | | HR | |
| Cobblestone tigerbeetle | | | | | x | | | | |
| **Dwarf wedgemussel** | x | | | x | | x | | | |
| Eastern kingbird | | | | | | | | HR | |
| Eastern small-footed bat | | | | | x | | | | |
| **Eastern towhee** | | | | | | | | HR | |
| **Field sparrow** | | | | | | | | HR | |
| Gray catbird | | | | | | | | HR | |
| Great crested flycatcher | | | | | | | | HR | |
| Jesup's milk-vetch | x | | | x | | | | | |
| **Least tern** | | x | | | | | | H | |
| Lesser yellowlegs | | x | x | | | | | M | |
| **Little brown bat** | | | | | x | | | | |
| **Louisiana waterthrush** | | | | | | | | HR | |
| Mallard | | x | | | | | | H | |
| **Marsh wren** | | | | | | | | HR | |
| New England cottontail rabbit | x | | | x | | | | | |
| Northeastern bulrush | x | | | x | | | | | |
| Northern flicker | | | | | | | | HR | |
| Northern long-eared bat | | | | x | | | | | |

| **Priority Species of Concern (*NALCC representative species are in bold)** | **NALCC[1]** | **BCC (BCR 30)[2]** | **BCC (BCR 14)[2]** | **Federally Threatened and Endangered Species** | **Petitioned for Federal Listing[3]** | **Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013** | **Listed in Refuge Purposes** | **BCR 30[4]** | **BCR 14[4]** |
|---|---|---|---|---|---|---|---|---|---|
| Northern parula | | | | | | | | | HR |
| Olive-sided flycatcher | | | x | | | | | | H |
| Osprey | | | | | | | x | | |
| Peregrine falcon | | x | x | | | | x | | M |
| Pied-billed grebe | | x | x | | | | | | |
| **Prairie warbler** | x | x | | | | | | HH | |
| Puritan tiger beetle | x | | | x | | | | | |
| Purple finch | | | | | | | | | HR |
| Rose-breasted grosbeak | | | | | | | | | HR |
| **Ruffed grouse** | | | | | | | | | HR |
| Rusty blackbird | | x | x | | | | | H | H |
| **Saltmarsh sparrow** | x | x | x | | | | | HH | |
| Scarlet tanager | | | | | | | | HR | |
| Seaside sparrow | x | x | | | | | | M | |
| **Semipalmated sandpiper** | x | x | x | | | | | H | HH |
| Short-billed dowitcher | | x | | | | | | H | H |
| **Shortnose sturgeon** | x | | | x | | x | x | | |
| Small-whorled pogonia | x | | | x | | | | | |
| **Snowy egret** | | x | x | | | | | M | |
| Solitary sandpiper | | x | x | | | | | H | |
| **Tri-colored bat** | | | | | x | | | | |
| Veery | | | | | | | | | HR |
| **Virginia rail** | | x | | | | | | | |
| Whip-poor-will | | x | | | | | | H | M |
| **Willow flycatcher** | | | | | | | | HR | |
| **Wood duck** | | | x | | | | | M | M |
| **Wood thrush** | x | x | x | | | | | HH | HH |
| **Worm-eating warbler** | | x | | | | | | H | |

| Priority Species of Concern (*NALCC representative species are in bold) | NALCC[1] | BCC (BCR 30)[2] | BCC (BCR 14)[2] | Federally Threatened and Endangered Species | Petitioned for Federal Listing[3] | Service's Northeast Region Fisheries Strategic Plan: 2009 to 2013 | Listed in Refuge Purposes | BCR 30[4] | BCR 14[4] |
|---|---|---|---|---|---|---|---|---|---|
| Yellow-bellied sapsucker | | | | | | | | | HR |
| Yellow-throated vireo | | | | | | | | HR | |

**Reference Notes:**

[1] *LCC – 2009 North Atlantic Landscape Conservation Cooperative Development and Operations Plan*

[2] *BCC (BCR 30, 14)- 2008 USFWS Birds of Conservation Concern for Bird Conservation Regions 30 and 14. Note: The resident game species and waterfowl were added to this list from the Land Acquisition Priority System.*

[3] *Species petitioned to be federally listed as threatened or endangered as of 2010*

[4] *BCR - Bird Conservation Region Plans–Rankings: HH–highest; H–high; M–medium; HR–high BCR responsibility*

Also, in section III below, under "Relationship of Project to Refuge System Policy on Strategic Growth," we describe in more detail how the following priority species of conservation concern meet the criteria cited in policy and would benefit from this proposal:

- Seven federally listed wildlife and fish species; an additional species proposed for Federal listing; and, one Federal candidate species.
- Three federally listed plant species.
- Twenty-four migratory landbirds of conservation concern (from Regional BCC 2014 list, and BCR 30 and 14 plans).
- Six waterfowl species of conservation concern (from Regional BCC 2014 list, BCR 30 and 14 plans, and ACJV.
- Twenty-eight representative (e.g. surrogate) terrestrial species (with some overlap in bulleted listings above), which in turn, represent over 100 benefitting species.
- Six representative (e.g. surrogate) aquatic species (list of benefitting species not determined yet).

External boundaries of CFAs are delineated to encompass the core biological area, but may be extended further to establish an effective administrative boundary, avoid redefining (dividing) ownership parcel lines, or to make a critical connection to other conserved lands.

One CFA is an exception to our presentation of discreet individual CFA boundaries. The Quonatuck CFA is conceived as 8,000 acres of priority habitat to be protected along the river's mainstem and its major tributaries (map C.3). The CFA's boundary approximates the 100-year floodplain for the mainstem and thirteen tributaries, as defined by the Federal Emergency Management Agency (FEMA; *http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping#2*; accessed March 2015). The 8,000 acres targeted for the Quonatuck CFA is in addition to the acreage identified for 6 other delineated CFAs that lie within, or partly within, the 100-year floodplain of the Connecticut River and its major tributaries.

Our priority in the Quonatuck CFA would be conserving functioning or restorable floodplain forests and wetlands, as well as tidal (salt, brackish, and freshwater) wetlands. We would seek to protect these habitats were they currently occur, where they can be restored, and/or where they are projected to migrate to in the future due to climate change and anticipated increases in sea level. We would also focus on conserving ownerships that include river frontage in these key areas. Areas of particular interest are depicted on map C.4. These highlighted areas were mapped by TNC to include existing floodplain forest, or areas of high potential for restoration where geomorphic characteristics favor the development of floodplain forest. Generally, we are assuming that this CFA would represent approximately 1,500 acres of tidally influenced wetlands and floodplain habitat along the mouth and lower extent of the river in Connecticut, approximately 1,500 acres of floodplain forest along the river in Massachusetts, and approximately 5,000 acres of floodplain forest along the upper portion of the river and distributed evenly between New Hampshire and Vermont.

The location and juxtaposition of all the CFAs within the larger existing conservation landscape would serve a critical role in connecting to an existing robust and very diverse conservation lands partnership. This contribution would also add value to the Service's investment in Conte Refuge. Protection of these areas in perpetuity would ensure that habitats remain intact and structurally and functionally sound to support species of conservation concern, and promote a more sustainable and resilient working landscape into the future as enumerated earlier.

## III. Project Relationship to Service Directives and Initiatives

### Relationship of Project to Strategic Habitat Conservation (SHC)

The Service adopted SHC as a science-based framework for making decisions about where and how to deliver conservation efficiently to achieve specific biological outcomes (*http://www.fws.gov/landscape-conservation/shc.html;* accessed April 2015). In collaboration with our partners, the public, and landowners, SHC is a way of thinking and doing business that requires us to set specific biological goals, allows us to make strategic decisions about our work, and encourages us to constantly reassess and improve our actions. The SHC framework integrates planning, design, delivery, and evaluation through an adaptive management approach.

Four principles guide SHC implementation:

- Start with ecologically meaningful scales.
- Work in partnership to maximize effectiveness and efficiency.
- Implement through an adaptive management framework.
- Use science and tools.

This project proposal embraces the concepts and all four principles of SHC. For example, we broadened our scope beyond existing refuge lands to make a concerted effort to integrate and complement the accomplishments of our partners within the watershed. The draft plan is proactive in confronting the challenges posed by climate change, invasive species, and habitat fragmentation due to changes in land use. Planning for an entire watershed of this size ensures a meaningful scale where results can be measured and monitored. Refuge goals, objectives, and strategies, as outlined in the draft CCP/EIS and this LPP, integrate refuge planning, management, and other related actions into the larger watershed landscape context and support the strategic collaborative, Connecticut River Watershed LCD project described below.

In support of the SHC framework, our proposal is consistent with and incorporates the best available science and strategies, responds to current and anticipated future conditions, encourages collaboration and leveraging with partners, and inspires action that makes effective and efficient use of available resources. All combined, these actions magnify and enhance the beneficial impacts of past and will guide future accomplishments within the landscape. Our proposal offers a spatially explicit strategy and depiction of desired future conditions, and helps provide a shared and adaptable strategy for achieving those conditions.

Together with management direction detailed in the draft CCP/EIS, we define clear priorities for wildlife and habitat conservation, and propose to implement these larger-scale conservation actions with multiple, and perhaps a few unconventional, partners. We would also continue our concerted efforts to promote communication and collaboration with the conservation, education, recreation, and economic stakeholders in the watershed. And, we would continue to actively work towards a healthy, integrated, and sustainable working landscape in the watershed.

*Map C.4. Priority Floodplain Forests Identified by The Nature Conservancy in the Connecticut River Watershed*

SHC is by definition an adaptive process, otherwise known as "learning by doing." There is tremendous interest in the watershed by a variety of partnerships to continue to collaborate and implement priority conservation actions within the framework of SHC. Our longstanding partnerships with Federal and state agencies, and non-governmental organizations, will continue to support implementation of ecoregional and State WAPS. Furthermore, we will continue to integrate our priorities with the North Atlantic Landscape Conservation Cooperative partners (NALCC; see below), an organization which was formed, in part, to implement SHC. As we move forward with implementation of existing and near-term strategies, we would continue to collaborate with others in seeking out new information and monitoring our actions in order to strengthen the scientific basis of our work.

### Relationship of Project to Refuge System Policy on Strategic Growth

In June 2014, the Service issued final policy on strategic growth of the Refuge System (*http://www.fws.gov/policy/602fw5.html*; accessed January 2015). This policy lists three priority conservation objectives for all future land acquisition: (1) recovery of federally listed threatened and endangered species; (2) conserving waterfowl by implementing the NAWMP and its Joint Venture implementation plans; and/or, (3) conserving migratory birds in decline identified in Birds of Conservation Concern (BCC) or Bird Conservation Region (BCR) ecoregional plans. This project proposal addresses all three of these conservation targets as described below.

### Federally Listed Threatened and Endangered Species

The watershed hosts eleven federally listed threatened and endangered species, one species proposed for federal listing as endangered, and one federal candidate (threatened) species. Ten of these species will benefit directly from land protection outlined in this proposal, although not all of these species' recovery plans specifically call for refuge land protection. Some recovery plans are over 20 years old and are in need of updating and were developed at times where proposing additional Federal land protection would have been met with resistance and, therefore, it was not considered as one of the potential alternatives or recovery strategies.

Below we highlight four federally endangered or threatened species present in the watershed that would benefit directly from this LPP proposal, and which have recovery plans or 5-year review plans that specifically mention land protection.

Dwarf wedgemussel–Endangered

This freshwater mussel is an inhabitant of muddy sand, and sand or gravel bottoms of rivers and streams. It once occurred throughout the Atlantic coastal plain from North Carolina to New Brunswick, but has been lost from a majority of known sites. Primary threats include habitat loss, habitat fragmentation, and altered natural river processes. Specifically, these threats include loss of riparian buffers, loss of floodplains, altered channel processes, sediment transport and granular sorting, altered hydrology, bank erosion, and dams. Pollutants from industrial and agricultural activities and other sources substantially impact mussel populations which are sensitive to pesticides, chlorine, potassium, zinc, copper, and cadmium (Nedeau 2009, USFWS 1993a).

This mussel once occurred along much of the river mainstem and many of its tributaries, but is no longer found in the mainstem in Connecticut and Massachusetts (USFWS 1993a). The species was rediscovered in the upper river in 1995, including 68 sites in the mainstem and 77 sites in tributaries. It occurs along a 16-mile reach of the river mainstem between Orford and Haverhill (New Hampshire) in an area referred to as the Middle Macrosite, and along a 21-mile reach from Dalton to Northumberland (New Hampshire) in an area referred to as the Northern Macrosite (Nedeau 2009). Small populations also exist in the Farmington River in the vicinity of Simsbury, Connecticut, in the Fort and Mill Rivers near Northampton and Hadley, Massachusetts, in a different Mill River in Deerfield and Whately, Massachusetts, and in the Ashuelot River near Keene, New Hampshire (Susi von Oettingen, 2010, pers.com. USFWS).

According to the 1993 recovery plan for the dwarf wedgemussel, the actions needed to recover the species include long-term protection of essential habitats through land acquisition and management agreements involving riparian habitat creating stream buffer zones. Where feasible, land acquisition was considered the most effective protection for the species and its habitat (USFWS 1993a). The dwarf wedgemussel occurs in two of the proposed CFAs: predominately in the Quonatuck CFA, which includes portions of the 100-year floodplain along the mainstem and tributary rivers, as well as the Ashuelot River CFA. The Ashuelot River is one of two rivers in the upper watershed where significant numbers of mussels have been found. The species also occurs in the Fort River, near the proposed

CFA, and historically occurred in the Mill River CFA. By acquiring land in these CFAs, we can benefit dwarf wedgemussel by permanently protecting its habitat and contributing to water quality protection.

Jesup's milk-vetch–Endangered

This plant exists only in the watershed and is confined to calcareous bedrock outcrops which are ice scoured annually (USFWS 1989). The only three known sites occur along a 16-mile stretch of the river in the towns of Plainfield and Claremont, New Hampshire and Hartland, Vermont. Habitat alteration and botanical collecting have been the major impacts to this plant. Trampling by humans also poses a threat due to canoe and kayak portaging near one site. An invasive plant, black swallow-wort, has expanded into the area from the nearby railroad tracks and threatens to displace the milk-vetch. Partners have worked to control the black swallow-wort.

The recovery plan for this species was issued in 1989 (USFWS 1989). The permanent protection of the plant's essential habitats was a high priority in the recovery plan. Protection measures listed included conservation easements, direct land acquisition, or other agreements with landowners. The 5-year review in 2008 stated that the plant continued to experience a high degree of threat and reaffirmed that the permanent protection of its known sites is critical (USFWS 2008b). In 2009, a Spotlight Species Action plan was completed specifically highlighting land acquisition by the refuge as part of the Service's role and responsibility in the species' protection and recovery (USFWS 2009b). The Quonatuck CFA proposed in this LPP encompasses these three sites.

Northeastern bulrush–Endangered

This plant is found in alluvial meadows and small headwater or coastal plain ponds characterized by seasonally variable water levels. Approximately 113 populations are known from 7 eastern States, with most of the populations occurring in Pennsylvania and Vermont (USFWS 2008). Within the watershed, 2 sites are known in Massachusetts, 9 in New Hampshire, and 22 in Vermont. Habitat alterations that make conditions consistently wetter or drier are the major threat to this species (USFWS 2006). Other threats include agricultural runoff, logging roads, fire roads, offroad vehicle use, and unauthorized collection. The Putney Mountain unit of the refuge, located in southern Vermont, was purchased to protect a population of this plant.

The recovery plan for this species was issued in 1993 (USFWS 1993c). This recovery plan for this species called from protection measures such as land acquisition and conservation easements (USFWS 1993c). The 5-year review echoed these recommendations, stating that the highest priority actions are to resurveying populations that have not recently been surveyed, securing protection on public and private lands, conducting periodic surveys of populations to determine trends and threats, and implementing management tools to reduce threats and monitor effectiveness of these actions (USFWS 2008). The 5-year review also stated that the species has high recovery potential. The northeastern bulrush occurs in small isolated wetlands in the West River CFA proposed in this LPP. Acquisition of these sites could help contribute to the species recovery.

Puritan tiger beetle–Threatened

The Puritan tiger beetle is an inhabitant of sandy riverine beaches along the river mainstem and sandy bluffs along the Chesapeake Bay in Maryland. The Puritan tiger beetle has declined along the river due to inundation and disturbance of its shoreline habitat from dam construction, riverbank stabilization, and human recreational activities. In addition, the flood control projects designed to control the river flows have also impacted the natural transport, deposition, sorting of sediment, and distribution of grain size. These alterations have impacted the availability of suitable habitat for the beetle. Of 11 known historic populations along the river, two remain (USFWS 1993b). One occurs in Northampton, Massachusetts, on a river beach owned by the City of Northampton and the Massachusetts Division of Fisheries and Wildlife. The numbers of adult beetles in this population decreased in the late 1980s, dropping below 50 adult beetles. Refuge staff and partners have been making a concerted effort there since 1996 to protect and augment this population from source populations in Connecticut. The last year beetles were reintroduced to the Northampton site was in 2006. In 2005, the number of adult beetles rose to 200, although it has declined since then. The other is a meta-population is near Cromwell, Connecticut, and comprises 350 to 500 individuals at three sites in close proximity. The Service recently purchased a 30-acre parcel for the refuge (Deadman's Swamp Unit) that supports adult beetles, although no larvae have been found there to date.

The recovery plan for this species was issued in 1993 (USFWS 1993b). The recovery plan called for protecting a minimum of three metapopulations established or maintained along the species historic range along the river. The 5-year review completed in 2007 recommended that a high priority be given to identifying private landowners that would be willing to enter into conservation easements for the protection and management of the river shoreline habitat supporting beetles (USFWS 2008). The Mill River and Quonatuck CFAs both support populations of the Puritan Tiger beetle. Land acquisition or conservation easements in these areas could help contribute to the species' conservation.

In addition to the four species above, there are six other federally listed or candidate species in the watershed that will benefit from our proposed LPP; however, these species respective recovery plans did not specifically identify land protection as a strategy. As noted above, many of these recovery plans are dated to a time when proposing land protection was not considered to be a viable option, or no recovery plan has been developed yet.

Shortnose sturgeon–Endangered
The shortnose sturgeon was first listed as endangered in 1967. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) published a shortnose sturgeon recovery plan in 1998. Although the sturgeon has disappeared from some rivers, it is still found in many rivers from Florida to New Brunswick. The Connecticut River population is considered one of 19 separate distinct population segments of this species in need of recovery.

Although it inhabits the river from Turners Falls, Massachusetts, to Long Island Sound, the Holyoke Dam separates the shortnose sturgeon into two populations. The total upriver population estimates ranged from 297 to 714 adult sturgeon (with less than 100 of those spawning in a given year), while the downriver population (which cannot reach the upstream spawning area) was estimated at around 875 adults. Recent evidence indicates that no successful reproduction occurs in the population below the Holyoke Dam. This downstream population is sustained by the influx of out-migrating sturgeon from the upstream group. Spawning in the river occurs from the last week of April to mid-May, as the spring flows wane, in specific rubble/boulder substrate. The primary impediment to sturgeon recovery is the presence of dams that obstruct migration and modify the historic flow regimes that cued the fish to spawning at appropriate times and places.

The Quonatuck CFA proposed in this LPP could benefit shortnose sturgeon by contributing to water quality protection by conserving lands adjacent to the river's mainstem.

Atlantic Sturgeon–Endangered
NOAA listed four Atlantic sturgeon distinct population segments (DPS) as endangered under the Endangered Species Act (ESA) in 2012. One of these distinct populations, the New York Bight DPS, includes habitat in the Connecticut River.

Atlantic sturgeon is managed under a Fishery Management Plan administered by the Atlantic States Marine Fisheries Commission (ASMFC). The plan includes measures for habitat conservation, restoration and improvement, monitoring of bycatch and stock recovery, and breeding/stocking protocols. There is also a State and Federal coast-wide moratorium on harvest of Atlantic Sturgeon (NOAA 2014).

Except for the occasional migrating individual, Atlantic sturgeon are rare in the river. In 2014, juvenile Atlantic sturgeon were found in the lower portion of the river. This documentation provides increased chances for recovery of this species in the river. The Quonatuck CFA and many of the CFAs in Connecticut proposed in this LPP could benefit Atlantic sturgeon by contributing to water quality protection from land conservation along the river mainstem.

Red Knot–Threatened
In December 2014, the Service listed the *rufa* red knot as federally threatened (79 FR 73706-73748). The "rufa" subspecies of red knot (*Calidris canutus rufa*) winters near the tip of South America and begins its long journey north to Arctic breeding grounds in mid-February, when they spend time at a number of coastal habitats along eastern North America, particularly Delaware Bay beginning in mid-May. The species has been recorded during migration along the coasts of Connecticut, Massachusetts, and New Hampshire. Major threats to the subspecies include loss of breeding and nonbreeding habitat, predation during breeding, reduced prey availability, and mismatches in the time of the species migrations and the availability of food and favorable weather conditions. Two of the proposed CFA may provide migrating habitat for red knots: Whalebone Cove and Salmon River CFAs.

Canada Lynx–Threatened

Lynx were historically found from Alaska to the Canadian Maritime Provinces, extending south in the Rocky Mountains, around the Great Lakes, and into New England. Today the species is secure in Alaska and Canada, but imperiled or extirpated in the continental U.S. Lynx occur in boreal and montane landscapes dominated by coniferous or mixed forest with thick undergrowth interspersed with more open habitats and young forests that support their principal prey, snowshoe hare.

Lynx are relatively rare in the contiguous U.S. because of habitats that are inherently unable to support cyclic, high-density snowshoe hare populations and are thus unable to sustain cyclic lynx populations (USFWS 2009). The principal factor affecting softwood forest types favored by lynx is timber harvest on non-Federal lands, however the influence of current forest practices on lynx is not known.

Lynx have been confirmed breeding in northeastern Vermont and New Hampshire. A family group was detected in the winters of 2012 and 2013 within the refuge's Nulhegan Basin Division. Lynx may also use habitats within the refuge's Pondicherry and Blueberry Swamp divisions since tracks have been found in the general area, although evidence of lynx at these divisions has not been detected.

There is currently no recovery plan for the Canada lynx, however, the Service has drafted a recovery outline for this species, an interim document prepared in advance of a Recovery Plan (USFWS 2005). The outline describes core, secondary and peripheral habitats areas that are believed to be important to the Canada lynx. The outline also lists preliminary actions needed for the species' recovery including retaining adequate habitat and management commitments in core and secondary areas, identifying and maintaining landscape connectivity between Canada and the contiguous U.S., and between core areas, identifying habitat and population limiting factors, and developing a post-delisting monitoring plan. In the recovery outline, the Upper Connecticut River Valley is included as a peripheral recovery area for the Canada lynx. However, since the recovery outline was drafted, recent sightings and data (2012-2013) show that Canada lynx are successfully reproducing on the existing Nulhegan Basin Division. A lynx has also been confirmed at the Pondicherry Division. Land acquisition or conservation easements within and in the vicinity of the Nulhegan Basin CFA and Pondicherry CFA to help protect core and connecting habitats may help benefit Canada lynx.

Northern long-eared bat–Threatened

In the Northeast, populations of northern long-eared bats have declined by 99 percent primarily due to white-nosed syndrome, a fungal disease. This medium-sized bat is especially susceptible to the disease in their wintering hibernacula; namely, caves and mines. These bats typically use large caves or mines for hibernacula, with large passages and entrances, constant, cooler temperatures, and high humidity with minimal air currents. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

During summer, the bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees in a wide variety of forested and wooded habitats. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. Potential roosts can include live trees and/or snags greater than or equal to 3 inches diameter-at-breast height that have exfoliating bark, cracks, crevices, and/or cavities. It has also been found, rarely, roosting in structures like barns and sheds. Breeding begins in late summer or early fall when males begin swarming near hibernacula. Potential habitat for the species exists throughout the watershed. The species has been documented occurring in at least three of the proposed CFAs: Ompompanoosuc River, Ottauquechee River, and White River CFAs.

The northern long-eared bat was listed in April 2015 (80 FR 17974). As such, the species does not yet have a recovery plan. Additional land protection is not expressly identified as a conservation effort at the time of listing; however, several measures are identified to protect hibernacula and summer breeding and maternity colonies from disturbance. These include: taking steps to minimize disturbance and vandalism at bat caves, such as installing bat-friendly gates, using best management forestry practices to conserve and restore forested and riparian habitats, establishing protection buffers around hibernacula, and limiting tree-clearing activities in winter to protect maternity colonies and in summer to protect non-flying pups.

New England Cottontail (NEC)–Candidate (Threatened)

The range of this once widespread rabbit has decreased by about 86 percent since 1960 (Fuller and Tur 2012). The primary cause seems to be a reduction of early successional forest habitat. Other factors include

high predation rates due to small, fragmented habitat patches, and gradual displacement by exotic Eastern cottontails which use a wider variety of habitats and appear to be less susceptible to predation.

Recent surveys have revealed that the NEC still occurs in scattered areas of Rhode Island, New Hampshire, and southern Maine, as well as Cape Cod and western Connecticut. In the watershed, it has only been found in Hartland, New Hartford, East Haddam, and Lyme, Connecticut. Given this conservation urgency, a range-wide NEC Initiative was established. This initiative involves collaboration from multiple agencies, including the Service, State wildlife agencies, universities, the Natural Resources Conservation Service (NRCS), TNC, and the Wildlife Management Institute, to address cottontail conservation on a landscape scale (Fuller and Tur 2012).

Forty-nine focus areas were identified as locations to manage and restore habitat for NEC. Two of these focus areas are within the proposed refuge acquisition boundary (Farmington River and Whalebone Cove CFAs). Early successional management and protection of adjacent natural shrubland habitat will meet the conservation goals set for the NEC.

In 2009, the Service developed a Spotlight Species Action Plan for the NEC. The action plan listed the threats to the species and made recommendation on how the Service and other partners could work together to conserve the cottontail. "A Conservation Strategy for the New England Cottontail" was developed and approved in November 2012, and provides the conservation and habitat management goals and strategies for this species (Fuller et al. 2012). The conservation strategy recognizes the importance of conserving and actively managing habitats to the species' future. Table 7.12 – Land Protection, in chapter 7 of the strategy (objective 801), specifically calls for purchasing lands (in fee or easement) at national refuge lands to be managed to benefit NEC.

**Waterfowl**

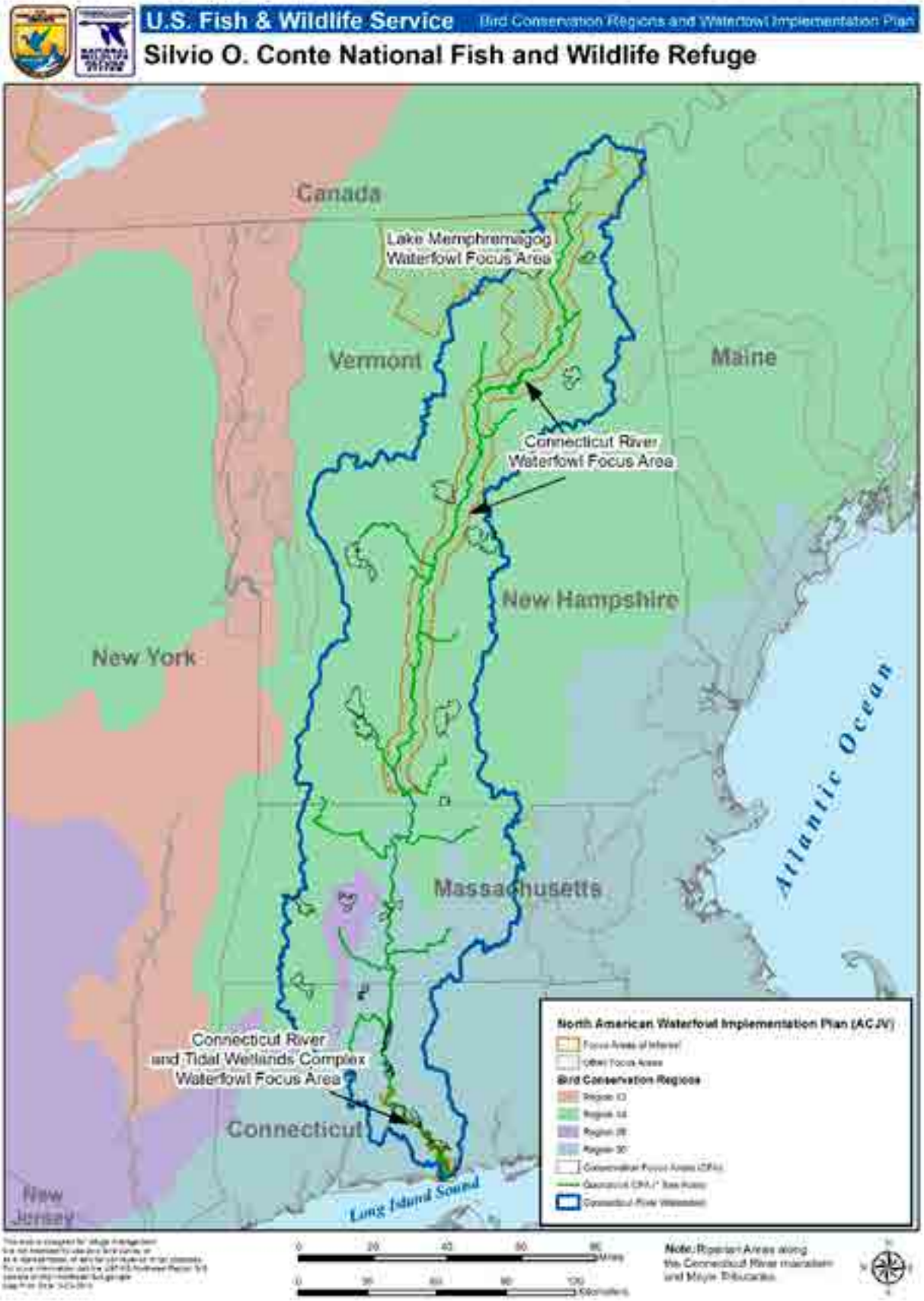
Twenty-seven species of ducks, geese, and swans rely on habitat within the watershed. The lower section of the river supports waterfowl year-round and has some of the highest and most significant concentrations of black duck in the Northeastern U.S. (Dreyer and Caplis 2001). The freshwater and tidal wetlands along the river, particularly in the lower portion of the watershed, provide important stopover habitat during both spring and fall migrations of waterfowl, including the American black duck. The habitats most important to black duck are the tidal wetlands along the mainstem, as well as the tidal wetlands and bays along the coast. In the winter, the river provides relatively ice-free open water habitat providing access to submerged aquatic vegetation, invertebrates and high calorie wetland vegetation. Many waterfowl also nest along the river, including mallards, black ducks, Canada geese, green-winged teals, gadwalls, and common merganser.

Further north in the watershed, many migrating ducks use flooded agricultural fields, floodplains, emergent wetlands, shrub swamps, and backwater areas along the river for stopover habitat. Species such as Canada geese, teal, mergansers, American black ducks, mallards, wood duck, and some sea ducks use the river corridor during spring and fall migration. The river and scattered small wetlands within the watershed provide prime breeding habitat for American black duck, wood duck, mallard, common merganser, and Canada geese. Other species nest along the river and elsewhere within the watershed, but are less common. Wood ducks are ubiquitous nesters in the watershed requiring large tree cavities which are associated with freshwater forested or shrub wetlands. They especially favor beaver ponds with heavy forest cover. Black ducks are a species of special management concern as previously described and are specifically mentioned in the Conte Refuge Act.

The ACJV's 2005 Revised Waterfowl Implementation Plan, a step-down plan from the NAWMP, identified three waterfowl focus areas in the watershed: (1) the Connecticut River and Tidal Wetlands Complex Focus Area ; (2) the Connecticut River Focus Area; and, (3) the Lake

Memphremagog Focus Area (map C.5) (*http://www.acjv.org/wip/acjv_wip_northeast.pdf;* accessed February 2015). These focus areas highlight the importance of the watershed to breeding, migrating, and wintering waterfowl. For each of these focus areas, the ACJV established habitat objectives to help conserve waterfowl populations. These same three focus areas coincide with target areas identified for American black ducks in the Conservation Action Plan for the American Black Duck (USFWS and Black Duck Joint Venture 2011). The Conservation Action Plan provided conservation recommendations for each target area to help conserve black duck habitats and populations. Below we describe the three waterfowl focus areas, their importance to waterfowl, the species that use these areas, habitat acreage targets, conservation recommendations, and which CFAs occur in these areas.

*Map C.5. North American Waterfowl Management Plan/Atlantic Coast Joint Venture Waterfowl Focus Areas and Proximity to Proposed Refuge Conservation Focus Areas*



Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area, Connecticut
This area contains some of the most extensive and highest quality fresh and brackish tidal wetland systems in the Northeast and was designated a Ramsar wetlands of international importance in 1994. The freshwater coves and tidal saltmarshes at the river mouth contain some of the most important areas for migrating and wintering waterfowl in the state. The remaining wild rice marshes in the focus area provide excellent foraging habitat for breeding, staging, and wintering waterfowl. In addition, large concentrations of American black duck, green-winged teal, mallard, and American wigeon use the wetland complex at the mouth of the river. Significant numbers of greater scaup, canvasback, ruddy duck, and Atlantic brant winter within the waterfowl focus area. This focus area encompasses four important bird areas. The area is important to black ducks throughout their annual cycle, providing nesting, stopover, and overwintering habitat.

The ACJV's habitat objective for this waterfowl focus area is 1,157 acres of wetland habitat. The Conservation Action Plan for the American black duck has the following conservation recommendations for this area:

- Cooperative management and conservation agreements to coordinate efforts across a mosaic of ownerships.
- Aggressive management of invasive species, including *Phragmites,* to restore habitats and prevent further degradation.
- Restoration of tidal marshes.
- Land acquisition, particularly of upland areas adjacent to wetland to provide buffers to maintain wetland structure and function.

The Quonatuck, Whalebone Cove, Salmon River, and Maromas CFAs are located in this focus area and land acquisition and protection in this CFA will help address waterfowl habitat needs and benefit waterfowl populations as indicated below in table C.2.

**Table C.2. Waterfowl Species Using the Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area, Connecticut**

| Species | Breeding | Migrating | Wintering |
|---|---|---|---|
| American black duck | ✓ | ✓ | ✓ |
| Green-winged teal | ✓ | ✓ | ✓ |
| Mallard | ✓ | ✓ | ✓ |
| American wigeon | | ✓ | ✓ |
| Greater scaup | | ✓ | ✓ |
| Canvasback | | ✓ | ✓ |
| Ruddy duck | | ✓ | ✓ |
| Atlantic brant | | ✓ | ✓ |

Connecticut River Waterfowl Focus Area, New Hampshire and Vermont
The river serves as an important migratory corridor for many species of waterfowl during the spring and fall migrations. Along both sides of the river there are numerous and extensive wetlands areas, such as oxbows, emergent wetlands, floodplain forests, and other forested wetlands, that provide waterfowl stopover, breeding, and wintering habitat. This area also contains prime breeding habitat for wood duck, black duck, mallards, and Canada goose. These habitats are important to black ducks throughout their annual cycle, providing nesting, stopover, and overwintering habitat.

The ACJV's habitat objective for this focus area is 3,450 acres of wetland habitat. The Conservation Action Plan for the American black duck has the following conservation recommendations for this area:

- Land acquisition by the Service (specifically the Conte Refuge) and other partners to protect important habitats.

- Managing and regulating public uses to limit disturbance.
- Controlling exotic species and removing dams to improve native habitats.

The Quonatuck, Ompompanoosuc River, and Mascoma River CFAs are located in this focus area and land acquisition and protection in this CFA will help address waterfowl habitat needs and benefit waterfowl populations as indicated below in table C.3.

**Table C.3. Waterfowl Species Using the Connecticut River Waterfowl Focus Area, New Hampshire and Vermont**

| Species | Breeding | Migrating | Wintering |
|---|---|---|---|
| American black duck | ✓ | ✓ | ✓ |
| Mallard | ✓ | ✓ | ✓ |
| Hooded merganser | ✓ | ✓ | ✓ |
| Common merganser | ✓ | ✓ | ✓ |
| Canada goose | ✓ | ✓ | ✓ |
| Wood duck | ✓ | ✓ | |
| Blue-winged teal | ✓ | ✓ | |
| Green-winged teal | ✓ | ✓ | |
| Ring-necked duck | ✓ | ✓ | |
| Common goldeneye | | ✓ | ✓ |
| Greater snow goose | | ✓ | |
| Atlantic brant | | ✓ | |

Lake Memphremagog Waterfowl Focus Area, Vermont

The 775,452-acre Lake Memphremagog Waterfowl Focus Area encompasses all of Orleans County, Vermont, and parts of Essex County, Vermont. The area's many remote wetlands have high value for breeding and migrating black ducks and other waterfowl. The area also has several relatively large wetlands and lakes, which provide important deepwater habitat for species such as common loons.

The ACJV's habitat objective for this focus area is 5,101 acres of wetland habitat. This focus area's many, scattered, remote wetlands have high-value for breeding and migrating American black ducks. The Conservation Action Plan for the American Black Duck has the following conservation recommendations for this area:

- Minimizing disturbance to remote wetlands and waterbodies to protect nesting waterfowl by following buffer zones and best management practices during timber harvesting.
- Acquiring additional lands (fee or easement) to protect high-quality habitat, limit shoreline development along ponds and lakes, and prevent disturbance to other wetlands.

The Nulhegan Basin CFA is located in this focus area and land acquisition and protection in this CFA will help address waterfowl habitat needs and benefit waterfowl populations as indicated below in table C.4.

**Table C.4. Waterfowl Species Using Lake Memphremagog Waterfowl Focus Area, Vermont**

| Species | Breeding | Migrating | Wintering |
|---|---|---|---|
| American black duck | ✓ | ✓ | |
| Wood duck | ✓ | ✓ | |
| Blue-winged teal | ✓ | ✓ | |
| Green-wing teal | ✓ | ✓ | |

| Species | Breeding | Migrating | Wintering |
|---|---|---|---|
| Hooded merganser | ✓ | ✓ | |
| Common merganser | ✓ | ✓ | |
| Ring-necked duck | ✓ | ✓ | |
| Canada goose | ✓ | ✓ | |
| Mallard | ✓ | ✓ | |
| Common goldeneye | | ✓ | |
| Bufflehead | | ✓ | |
| Lesser scaup | | ✓ | |
| Greater scaup | | ✓ | |

Overall, our land acquisition proposal would make significant contributions toward waterfowl habitat objectives. We anticipate these contributions will meet or exceed the habitat objectives for the ACJV Connecticut River Focus Area and the Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area and contribute significantly to the habitat objectives in the Lake Memphremagog Waterfowl Focus Area (attachment I). The project would contribute to implementing the NAWMP by acquiring lands in the CFAs that overlap these focus areas, and would help meet the population objectives in the respective ACJV plans.

The wood duck is identified as a high priority species for the Atlantic Flyway Council and as a continentally high priority species for the NAWMP and the ACJV. BCR 14 is recognized by the NAWMP as a high priority region for breeding wood duck. BCR 30 is considered a moderate priority region for breeding wood duck. While no regional population objectives have been established for wood duck, the regional priority rankings suggest that the watershed can make significant contributions to sustaining the Atlantic Flyway population at or above target levels for harvest management purposes. Implementation of this LPP would provide significant breeding habitat for American black duck and wood duck, potentially supporting approximately 946 and 4,100 breeding pairs, respectively (attachment I).

**Migratory Birds**

The watershed serves as one of the major "north-south" migration corridors within the expansive Atlantic Flyway, flanked by the Atlantic coastal corridor to the east and the Champlain Valley corridor to the west. Hundreds of species of migratory and resident birds inhabit the watershed. These species encompass 17 taxonomic orders and 46 families of birds ranging from the well-known Canada goose and American robin to the rare golden-winged warbler and boreal owl (DeGraaf and Yamasaki 2001). Fifteen species of shorebirds, and 24 other water-dependent species such as rails, grebes, and herons, use the watershed for breeding, wintering, or migration. The refuge is also host to 157 passerine species and 24 raptor species. Of these, 88 are neotropical migrants that breed in the watershed, 77 are residents that breed and winter here, and 16 are winter residents that migrate to the watershed from the north. Certain species such as mourning dove, American robin, red-tailed hawk, American crow, cedar waxwing, and American goldfinch have both migratory and resident populations (DeGraaf and Yamasaki 2001). The watershed supports 60 bird species that have been listed by one or more bird conservation plans or initiatives as species of concern.

The contribution to migratory birds and their habitat was a major consideration in delineating CFAs for refuge acquisition. For the purposes of relating those contributions quantitatively, in attachment I to this LPP, we detail the potential number of breeding migratory birds that could be supported within the proposed CFAs, and the acres of potentially suitable habitat.

We compare our estimates for the CFAs and conserved lands to population and habitat objectives that have been established at the BCR and State scales as reported in BCR 14 and BCR 30 conservation plans. Examining the benefits provided by existing conserved lands provides perspective on what additional migratory bird benefits would be provided to the conservation estate by acquiring the proposed CFAs. We profile six neotropical migrant species that are identified as Priority Refuge Resources of Concern (PRRC), are priority species within BCR plans, and which represent the range of upland and wetland habitat types within the proposed CFAs. Those species are:

- Wood thrush.
- Canada warbler.
- Blackburnian warbler.
- Black-throated blue warbler.
- American woodcock.
- Bobolink.

In addition, four of the six species profiled (e.g. wood thrush, blackburnian warbler, American woodcock, and bobolink) are identified as representative species by the NALCC. We also present contributions to neotropical migrant stopover habitat (attachment I).

We summarize the results of our analysis in the table C.5 below.

**Table C.5. Contribution of All Proposed CFAs to BCR Population Objectives for Select Migratory Bird Species***

| Species | Percent (%) of total BCR 14 population objective supported by all CFAs | Percent (%) of total BCR 30 population objective supported by all CFAs |
|---|---|---|
| Wood thrush† | 1.8% | 0.6% |
| Blackburnian warbler | 3.1% | 6.4% |
| American woodcock | 2.2% | 2.0% |
| Bobolink† | <0.1% | 1.2% |
| Black-throated blue warbler | 4.3% | 17.0% |
| Canada warbler† | 1.6% | 11.0% |

** The total proposed CFA acreage (197,800 acres) represents 0.2 percent of total BCR 14 acreage, and 0.1 percent of total BCR 30 acreage.*

*† Species on draft BCC 2014 list; both U.S. breeding and migration habitat limited.*

In summary, this LPP would make important contributions toward Regional and State-level breeding population objectives for several neotropical migrant species of conservation concern. In addition, a study of neotropical migrant habitat use during migration suggests that habitat protection, especially forest and shrub wetlands along the mainstem of the river within Connecticut and Massachusetts, will significantly benefit neotropical migrants during the spring migration (*http://www.science.smith.edu/stopoverbirds/index.html*; accessed March 2013).

In table C.6 below, we provide a summary of how our proposed individual CFAs support the three Strategic Growth policy conservation targets.

**Table C.6. Summary of the Relationship of Proposed CFAs to the Service's Strategic Growth Policy Conservation Targets.**

| Proposed Conservation Focus Area (CFA) | Strategic Growth Policy Targets | | |
|---|---|---|---|
| | Federally listed species* | Waterfowl (NAWMP/ACJV Focus Area Objectives) | Migratory Birds (BCC 2014 species whose migration and breeding habitat are limited) |
| Ashuelot River CFA | **Dwarf wedgemussel** | | Breeding habitat for:<br>Canada warbler<br>Eastern whippoorwill<br>Wood thrush |
| Blueberry Swamp CFA | | | Breeding habitat for:<br>Canada warbler<br>Eastern whippoorwill<br>Olive-sided flycatcher |

| Proposed Conservation Focus Area (CFA) | Strategic Growth Policy Targets | | |
|---|---|---|---|
| | **Federally listed species*** | **Waterfowl (NAWMP/ACJV Focus Area Objectives)** | **Migratory Birds (BCC 2014 species whose migration and breeding habitat are limited)** |
| Dead Branch CFA | | | Breeding habitat for:<br>Black-billed cuckoo<br>Canada warbler<br>Eastern whippoorwill<br>Wood thrush |
| Farmington River CFA | New England cottontail (candidate) | | Breeding habitat for:<br>Canada warbler<br>Wood thrush |
| Fort River CFA | | | Breeding habitat for:<br>Bobolink<br>Migration habitat for:<br>Canada warbler<br>Wood thrush<br>Olive-sided flycatcher<br>Bobolink |
| Maromas CFA | | ACJV Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area | Breeding habitat for:<br>Cerulean warbler<br>Wood thrush |
| Mascoma River CFA | | ACJV Connecticut River-Vermont and New Hampshire Waterfowl Focus Area | Breeding habitat for:<br>Bobolink<br>Canada warbler<br>Wood thrush |
| Mill River CFA | **Puritan tiger beetle** | | Migration habitat for:<br>Canada warbler<br>Wood thrush |
| Nulhegan Basin CFA | Canada lynx | ACJV Lake Memphremagog Waterfowl Focus Area | Breeding habitat for:<br>Canada warbler<br>Eastern whippoorwill<br>Olive-sided flycatcher |
| Ompompanoosuc CFA | Northern long-eared bat | ACJV Connecticut River-Vermont and New Hampshire Waterfowl Focus Area | Breeding habitat for:<br>Canada warbler<br>Eastern whippoorwill<br>Wood thrush |
| Ottauquechee River CFA | Northern long-eared bat | | Breeding habitat for:<br>Eastern whippoorwill<br>Wood thrush |
| Pondicherry CFA | | | Breeding habitat for:<br>Bobolink<br>Canada warbler<br>Eastern whippoorwill<br>Olive-sided flycatcher |
| Pyquag CFA | | | Migration habitat for:<br>Canada warbler<br>Wood thrush<br>Lesser yellowlegs<br>Semipalmated sandpiper<br>Wood thrush<br>Olive-sided flycatcher<br>Bobolink |

| Proposed Conservation Focus Area (CFA) | Strategic Growth Policy Targets | | |
|---|---|---|---|
| | **Federally listed species*** | **Waterfowl (NAWMP/ACJV Focus Area Objectives)** | **Migratory Birds (BCC 2014 species whose migration and breeding habitat are limited)** |
| Quonatuck CFA | **Dwarf wedgemussel, puritan tiger beetle, Jesup's milk vetch,** shortnose sturgeon | ACJV Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area (CT) and ACJV Connecticut River-Vermont and New Hampshire Waterfowl Focus Area | Migration habitat for:<br>Canada warbler<br>Wood thrush<br>Canada warbler<br>Wood thrush<br>Lesser yellowlegs<br>Semipalmated sandpiper<br>Sanderling<br>Wood thrush<br>Olive-sided flycatcher<br>Bobolink<br>Cerulean warbler<br>Saltmarsh sharp-tailed sparrow<br>Whimbrel<br>Black rail<br>Black skimmer |
| Salmon Brook CFA | | | Breeding habitat for:<br>Bobolink<br>Migration habitat for:<br>Canada warbler<br>Wood thrush |
| Salmon River CFA | Red knot (rufus sp.), New England cottontail (candidate) | ACJV Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area | Breeding habitat for:<br>Wood thrush<br>Cerulean warbler<br>Eastern whip-poor-will<br>Black-billed cuckoo<br>Prairie warbler<br>Migration habitat for:<br>Sanderling<br>Lesser yellowlegs<br>Semipalmated sandpiper<br>Wood thrush<br>Olive-sided flycatcher<br>Cerulean warbler |
| Scantic River CFA | | | Migration habitat for:<br>Canada warbler<br>Wood thrush |
| Sprague Brook CFA | | | Breeding habitat for:<br>Canada warbler<br>Wood thrush<br>Black-billed cuckoo |
| West River CFA | **Northeastern bulrush** | | Breeding habitat for:<br>Canada warbler<br>Eastern whippoorwill<br>Wood thrush |
| Westfield River CFA | | | Breeding habitat for:<br>Black-billed cuckoo<br>Canada warbler<br>Eastern whippoorwill<br>Wood thrush |

| Proposed Conservation Focus Area (CFA) | Strategic Growth Policy Targets | | |
|---|---|---|---|
| | **Federally listed species*** | **Waterfowl (NAWMP/ACJV Focus Area Objectives)** | **Migratory Birds (BCC 2014 species whose migration and breeding habitat are limited)** |
| Whalebone Cove CFA | Red knot (rufus sp), New England cottontail (candidate) | ACJV Connecticut River and Tidal Wetlands Complex Waterfowl Focus Area | Breeding habitat for:<br>Black-billed cuckoo<br>Bobolink<br>Cerulean warbler<br>Eastern whip-poor-will<br>Prairie warbler<br>Migration habitat for:<br>Sanderling<br>Lesser yellowlegs<br>Semipalmated sandpiper<br>Wood thrush<br>Olive-sided flycatcher |
| White River CFA | Northern long-eared bat | | Breeding habitat for:<br>Canada warbler<br>Eastern whippoorwill |

* *Species in* **bold** *are federally listed species that have Service land protection identified as a strategy within their recovery plan. All other species are federally listed and Federal candidate species that do not have land acquisition mentioned in their recovery plan or do not have a recovery plan.*

**Relationship of Project to NALCC Representative (i.e. Surrogate) Species and Other Priority Species and Habitats**
In 2009, the NALCC partnership published a development and operations plan which evaluated 74 species (including plants, all taxa of wildlife, fish, and other aquatic species), of highest priority for conservation for that geographic region based on consultations with BCR teams, ACJV teams, fish habitat partnerships, and the Service's endangered species program. Table 1, presented earlier, lists those species occurring within the watershed. This priority species list served as an initial starting point for biological planning and conservation design within the NALCC, and provided guidance in developing this LPP. This LPP provides important habitat protection and/or potential enhancements for these highest priority species identified in the NALCC plan.

In 2011, the Service began facilitating a process to collaboratively identify "surrogate" species within each geographic LCC. This was a response to addressing the sheer number of species for which the Service, respective States, and other partners work with, and the impracticality of designing and conserving landscape-scale habitats on a species-by-species basis. The basic concept is that conserving habitat for surrogate species will also address the needs of a larger group of species or other conservation targets (e.g., water quality, forest, or grasslands, etc.). Selected surrogate species and targets were used as the basis for regional conservation planning efforts within watershed landscape or geographic area. It was a practical step in implementing the SHC approach, using the best available science to conserve landscapes supporting multiple species. The surrogate species approach informed our agency's management practices and systems, and enabled the Service to make smarter, more cost-effective conservation and management decisions and propose investments in this LPP. Most importantly, it improved our ability to work with partners to sustain abundant, diverse, and healthy populations of fish, wildlife and plants now and in the future in the watershed and as an agency (*http://www.fws.gov/landscape-conservation/selecting-species.html;* accessed March 2014.)

The NALCC was one of the first LCC partnerships in the country to initiate the process to identify and select surrogate species. This partnership uses the term "representative" species in place of surrogate species.

**Representative (e.g. Surrogate) Species Selection**
The NALCC has designated an initial set of representative species as a tool for strategically conserving habitat at landscape scales (*http://www.fws.gov/northeast/science/representative_species.html*). In 2011, the NALCC held workshops in each of its three sub-regions (northern New England and New York, southern New England and New York, and mid-Atlantic), where Service scientists and other experts selected a total of 87 terrestrial and wetland species to compile a NALCC representative species list. A subsequent effort identified 12 aquatic

representative species. Some, but not all of these species, were identified as highest priority in the 2009 NALCC operations plan. Of the 99 representative aquatic and terrestrial species, 34 occur in the watershed.

The large proportion of LCC priority species supported in the watershed is a reflection of the broad diversity of habitats present, including habitat that is vital to species that range from migratory fish to boreal forest obligates. The watershed is centrally located in the NALCC; and ranges in elevation from sea level to the highest elevation (6,288 feet) in New England. Using the list, representative species are paired with each of the priority habitats included in each of the CFAs. Further details are available in appendix A of the draft CCP/EIS. These species were used to help inform, focus, and evaluate the potential contributions of each CFA identified for habitat protection.

**Relationship of Project to the Connecticut River Watershed Landscape Conservation Design (Connecticut River Watershed LCD) Pilot Project**

The CCP core team has continuously worked collaboratively with the four states on identifying and refining the CFAs identified in this LPP proposal since the CCP planning process was initiated in 2006 using an array of information made available by the states and other partners. During 2014, the CCP team spent a considerable amount of time working with the four respective State fish and wildlife agencies to seek preliminary agreements on those boundaries. The Connecticut River Watershed LCD Pilot Project was launched in February 2014, with a final design released in May 2015. The project is now moving into its next phase of implementation. CCP core team members participated in the Connecticut River Watershed LCD project, and thus, were able to share information from the LPP process, as well as compare and integrate LCD project results into this LPP proposal.

What follows is an overview of the Connecticut River Watershed LCD. The project has been well-documented and can be further reviewed at: *http://northatlanticlcc.org/groups/connecticut-river-watershed-pilot* (accessed January 2015).

The LCD planning effort is being facilitated by the Service and supported by the NALCC. However, key to its success is the 30-member core team of conservation partners composed of Federal and State agencies and private organizations working at various scales in the watershed. As noted above, refuge staff have participated on the LCD core team, as has the leadership of the Friends of the Silvio O. Conte National Fish and Wildlife Refuge (Friends of Conte Refuge), an association of local to national conservation, education, and recreation organizations. Fundamentally, the Connecticut River Watershed LCD is a collaborative effort among partners to develop a strategic plan for the watershed that will sustain habitat for fish, wildlife, and plants within a working landscape, while also reliably providing clean water, storm protection, recreation and many other natural benefits that support people and communities. It is intended to guide collective conservation actions within the watershed and connect to broader regional conservation goals for conserving sustainable fish and wildlife populations and their habitat for people.

The LCD planning effort pioneers the use of new decision support tools and the best available science to set goals and measurable objectives for representative species of fish and wildlife (and supporting ecosystems). It also translates those goals and objectives into projections of the amount, type, and distribution of habitat needed to sustain species and habitats at those levels. Also distinctive is the fact that it integrates expectations for climate change, urban growth, and other land-use changes and pressures.

The LCD project's stated objectives are to:

- Establish common conservation goals and objectives for species and ecosystems in the watershed that are informed by watershed and regional priorities.
- Develop a strategic landscape design that prioritizes places, and identifies strategies and actions, necessary to meet and sustain those goals and objectives into the future.
- Deliver information, maps, and tools with design options at multiple scales (e.g. local, State, and Regional scales) and in formats needed by partners to guide conservation decisions and inform planning (e.g. town master plans, refuge CCPs, National Forest Plans, and State WAPs).
- Establish a process for conducting landscape conservation design that can be applied and adopted elsewhere in the region.

There are over 20 primary products from the LCD project that are available and will serve, either separately or combined with other products, as useful decision-support tools for strategic conservation design work in the watershed. One significant product is the identification of a terrestrial core-connector land conservation network for the watershed. The terrestrial core-connector network represents a synthesis of ecological information and is designed to provide strategic guidance for conserving natural areas, and the fish, wildlife, and other components of biodiversity that they support within the watershed. The terrestrial core areas are created from a combination of 14 representative species habitat capability indices, and a terrestrial ecosystem-based core area selection index that includes metrics for integrity and resiliency. This proposed LPP fully complements and supports the Connecticut River Watershed LCD terrestrial core-connector network. Attachment III provides an example of how some of the LCD products (e.g. ecological integrity selection index, a species habitat capability index, and the terrestrial core-connector network), overlap with proposed CFAs.

The Connecticut River Watershed LCD core team set a conservation target of including approximately 25 percent of the watershed (approximately 1.8 million acres) in terrestrial core areas. The core areas are delineated based on ecological criteria without consideration of their current conservation status. Approximately 25 percent of the watershed is already currently under some form of protection within the watershed; but, only half (50 percent) of these protected acres (~900,000 acres) fall within an LCD terrestrial core area boundary. Our project proposal would allow refuge lands to contribute another approximately 110,000 acres toward insuring that the terrestrial core areas are conserved.

We anticipate that the Connecticut River Watershed LCD products will stimulate discussion and facilitate strategic conservation decisions in the watershed as more people become aware of them. We will help raise awareness of these products as we distribute the Conte Refuge draft CCP/EIS for public review and comment. These products, which include modeling the effects of climate change, land use change, and other landscape considerations, will be valuable tools for informing Federal and State agency, and local community, land use decisions.

**Relationship of Project to Refuge System's Urban Initiative**

The 7.2 million-acre Connecticut River watershed includes about 396 communities, 2.4 million residents, and two large New England urban areas: Springfield, Massachusetts (153,552 residents) (2013 U.S. Census) and Hartford, Connecticut (124,893 residents). Springfield is the fourth largest urban area in New England; only Boston (#1), Worcester (#2), and Providence (#3) are larger.

The proximity of existing and proposed Conte Refuge lands to major urban centers, such as Springfield, Massachusetts and Hartford, Connecticut, presents tremendous opportunity to reach new audiences who do not necessarily know about the Service and Refuge System, and therefore are less likely to visit refuge lands. Map C.2 shows major urban areas within the watershed, their proximity to existing conserved lands, and their distribution along the mainstem of the Connecticut River and its major tributaries. Proposed CFAs in proximity to these urban centers include: the Fort River and Mill River CFAs in Massachusetts, and the Farmington River, Salmon Brook, Scantic River, Pyquag, Maromas, Salmon River, and Whalebone Cove CFAs in Connecticut. The ever-growing urban population will be a critical constituency to engage as we work to ensure that future Americans continue to care about conservation. Connecting with urban communities is a major initiative within the Refuge System (*http://www.Fws.Gov/urban/index.Php*; accessed January 2015). The goal of the Urban Wildlife Refuge Program is to engage urban communities as partners in wildlife conservation through collaborations both on and off Service lands.

Existing and proposed Conte Refuge lands are strategically situated to provide opportunities for urban residents to directly experience the outdoors through fishing, hunting, wildlife observation, photography, environmental education, interpretation, and other compatible outdoor recreational pursuits. In addition, the Conte Refuge's existing and potential partnerships that operate in the urban environment are many and diverse. These partnerships include the Friends of Conte Refuge, Springfield Museums, Springfield Public Schools, City of Springfield, Re-green Springfield, Connecticut River Watershed Council, and Federal and state agencies. The refuge would also support urban education programs through implementing established programs such as Adopt-A-Habitat, Conte Corners, the Watershed on Wheels (WoW Express), Youth Conservation Corps, Student Conservation Association crews, and volunteers.

It is through opportunities like these on and off refuge lands that people will establish a relationship with nature, learn about our agency's important role in conservation, become citizen stewards, and garner an appreciation of the importance of sustainable conservation action in providing ecosystem and community

services such as the quantity and quality of water and open space. As a result, many people become inspired to help protect and nurture public lands as citizen stewards.

## IV. Threats to Watershed Resources and How This Proposal Addresses Them

### Potential Threats to Resources

The threats to America's land, water, fish and wildlife, and cultural resources are greater than any one agency or organization can address alone. Threats such as land use change, a changing climate, and invasive species have the potential to affect multiple species and resources across an entire landscape. These stressors are amplified by habitat fragmentation, loss of wetlands, and reduced water quality, quantity, flows, and impaired function, posing ever greater challenges and threats to the quality, connectivity, and sustainability of watershed resources.

**Climate Change**

As the climate changes, the impact affects the full spectrum of habitats due to changes in temperature, precipitation, and water level (increases and decreases). While the timing, extent, and location of these changes are not known, investments in land conservation that facilitate appropriate habitat connectivity (aquatic and terrestrial) in area (size), elevation, and latitude could help temper the impact, giving our Federal trust resources more opportunity to emigrate and the time to adjust and adapt. This proposal, along with existing and planned partner actions, would strive to assemble larger, better connected, more resilient, and redundant areas within the conservation estate that would afford ideal opportunities to evaluate, address, and employ adaptive management over time to temper the impacts of future climatic challenges on our Federal trust resources.

**Land Use Change and Habitat Fragmentation**

The river has been impacted by changes in land use, especially over the last 150 years. Changes in technology have dramatically changed farming, forestry, and real estate development while generational succession of landowners and the settlement of estates and the related impacts on parcel size and ownership pattern has changed the configuration of land use and management. Habitat fragmentation is typically preceded by ownership fragmentation. Ownership fragmentation in the watershed continues to increase as does the threat of development (commercial and residential). When the individual ownerships decline in size, and the purchase prices of smaller ownerships are reduced commensurately, the land becomes more available to a wider spectrum of potential buyers. As property changes hands or moves from one generation to the next, ownerships begin to fragment and become smaller. As ownerships become smaller, they are potentially more susceptible to conversion for development or other uses. A major focus of this proposal is to protect and assemble larger contiguous habitats within the existing watershed land conservation mosaic along latitudinal and elevation gradients in an effort to counter ownership and habitat fragmentation.This approach also accrues benefits to our desired outcomes for diversity and connectivity in area, aspect, process, and substrate that is well connected to a well-represented, redundant, and resilient core conservation network.

**Impacts to Water Quality and Quantity and Wetlands**

Refuge staff have been working with the Service's Fisheries program, the NALCC, and other Federal and State agencies and private organizations to evaluate impediments to the functioning of natural hydrologic systems in the watershed. Our focus has been on determining which impediments have the greatest effect on wildlife and aquatic species movement, water quality and quantity, duration and timing of flooding, and the health and integrity of wetlands. We are working with partners to identify and prioritize areas of greatest impact and to develop an implementation strategy to improve water quality and quantity, and the timing and duration of flow. With our partners, we have started working with local jurisdictions to identify opportunities for funding from the Department of Transportation (public land) and Department of Agriculture (private land) to improve road crossings, and the management of storm water and dams.

Protection of wetlands, floodplain forest, and riparian habitat is a major emphasis of this proposal. Restoring and maintaining the integrity of wetlands and other waters is one of the purposes in the Conte Refuge Act. We are also working with our partners to identify floodplains and wetlands that are a priority for protection and as feasible, the restoration of the structure and function of the floodplain forest and wetland complex.

**Invasive Species**

Controlling invasive species is a major focus of current refuge management programs. Today, many communities are faced with threats from exotic species such as Japanese knotweed, oriental bittersweet, garlic

mustard, water chestnut, purple loosestrife, Asian long-horned beetle and others. Our ability to effectively limit the impacts of these invaders is partially dependent on large-scale, intact, and resilient landscapes, such as those in our refuge proposal, which can be more resistant to new infestations when addressed at the CPA level.

### How Project Proposal Addresses Threats from Climate and Land Use Change

When the refuge was authorized in 1995, the projected impacts of climate and land use change were not understood as they are today. Models to predict climate and land use changes have greatly improved in recent years. Today, we have more information and more sophisticated decision support tools to identify priority areas for protection to respond and better prepare for those changes.

This LPP, in conjunction with the land protection, restoration, and management programs of our partners working in the watershed, promotes the biological diversity, integrity, and resiliency of upland and wetland ecosystems in an amount and distribution that contributes to sustaining ecological function, supports healthy populations of native fish and wildlife, and anticipates the effects of climate and land use changes.

As noted previously, we used data and outputs from the Connecticut River Watershed LCD, TNC, State fish and wildlife agencies and other conservation partners, agency personnel expertise, and a myriad of other data sets to identify, compare, and contrast the CFAs with the highest quality habitat and the most intact, integral, and resilient places in the landscape. The proposed CFAs, in conjunction with the conserved lands network, will help conserve a resilient and integral landscape, and fortify the full spectrum of physical characteristics, to support species diversity in the face of anticipated climate and land use changes.

#### Connectivity of Protected Habitats

On a landscape scale, the diversity in substrate and topography (elevation and aspect), and the range in latitude, within the watershed allow for diverse, strategic, and sustainable connections between the Long Island Sound, White Mountains, Green Mountains, and the Northern Forest. These connections will increase opportunities for species migration and adaptation in response to climate change. For example, connecting and protecting floodplain forest and riparian areas, and efforts to reestablish a more natural flow of water within the watershed, which are all a priority in this proposal, will minimize the anticipated impacts from more frequent and intense flood events expected from climate change.

The CFAs along the mainstem in the lower reaches of the watershed are vital to the landward migration of the tidally influenced coastal wetland complex due to anticipated increases in sea level attributed to climate change. The lower portion of the river is not obstructed until the first dam in Holyoke, Massachusetts, a point that is well above the head-of-tide which is presently near Hartford, Connecticut. As the sea level rises, the fortunate absence of mainstem dams could allow the existing tidally influenced coastal wetland complex (salt, brackish, and fresh) to "migrate" upriver over time, provided the appropriate lands have been protected.

#### Habitat Resiliency

The term "resilience" refers to the capacity of a site to remain viable and adapt to climate change while still maintaining diversity, but does not assume that the species currently located at these sites will necessarily be the same species present in a century or two (*https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/ne/Pages/default.aspx*; accessed March 2013). Instead, if the land is conserved, the area will support species that thrive in the conditions defined by the physical setting. The CFAs, in conjunction with other conserved lands in the watershed, would conserve a spectrum of physical settings that are connected in latitude, elevation, aspect, and substrate, thus providing a gradient of exposure, temperature, and moisture. This diversity will help increase resiliency within the landscape, in part, by supporting a wide variety of microclimates. Furthermore, a well-distributed conserved lands network, reducing barriers and minimizing fragmentation, would promote resilience by facilitating range shifts and the reorganization of ecological communities.

## V. Partnerships Important for Project Design and Implementation

### Established Partnership Framework

The Northeast Region is a large and populous region with diverse opinions, backgrounds, and politics. While the 13 States in the Region account for about 7 percent of our Nation's land base, it is home to about 25 percent of our Nation's population. Much has changed since the refuge was authorized in 1995. At that time, there was widespread skepticism about the value of Federal government involvement in the watershed. Based on our

refuge partnerships, demonstrated actions, and shared outcomes, our relationship with the area communities, State agencies, and congressional delegations in the four States has strengthened over the past 15 years.

This proposal would further enhance the Service's collaborative, landscape-scale, partner-driven approach in the watershed and complements the vision which led to the passage of the Conte Refuge Act in 1991. As proposed, an expanded and strategic refuge design offers the opportunity to demonstrate the integrated implementation of SHC and adaptive management in a partnership approach to support the NAWMP/ACJV, endangered species recovery plans, BCR priorities, and habitats identified by the NALCC within a large watershed and landscape-based conservation mosaic. Further, it provides a framework and a forum for engaging multiple Federal agencies, State agencies, local municipalities, private organizations, interested landowners, and individual citizens in conservation, education, recreation, and sustainable and complementary economic efforts. Goal 4 in the draft CCP/EIS details how the refuge would continue to initiate, support, and promote partnerships with other Federal, State, and local governments, Tribal governments, and private individuals and organizations

Specifically, our partnership goals with this LPP include the following:

- Conserving and protecting an array of terrestrial and aquatic habitats that support federally listed threatened or endangered species, waterfowl and other migratory birds as described in Service, State, and partner-supported plans;
- Monitoring and addressing socio-cultural values of interest to local communities, in particular, ecosystem services, as well as resource impacts associated with climate and land use changes;
- Providing opportunities to demonstrate adaptive land management techniques in response to landscape changes, and support those activities on partner and private lands;
- Seeking opportunities for partners to combine their strengths to make important contributions to conservation, and to link exceptional wildlife and public use values within reach of one of the most highly populated regions in the country; and
- Providing opportunities to connect people with nature in rural to urban settings by protecting public access and offering compatible programs to engage and motivate people to learn about and enjoy nature and act to conserve it.

While the Service contribution of conserving approximately 197,296 acres may only represent less than 3 percent of the 7.2 million-acre watershed, and about 10 percent of the existing conservation estate (1.8 million acres +/-), when added to the existing public and private conservation accomplishments, the benefits accrued to targeted trust resources and the overarching watershed partnership will be considerably greater. Decades of work to promote partnerships for wildlife habitat, outdoor recreation, working forest and farms, and leveraging these programs, has magnified the potential beneficial impact in the watershed. Approval of this proposal would expand the impact of the Service to accomplish those benefits working with conservation partners, landowners, and other stakeholders in the watershed.

A notable successful partnership is the Friends of Conte Refuge which is best described as an association of approximately 70 conservation, recreation, education, and organizations and public agencies  Over the past decade, the group has increased in representation, scope, and sophistication, and now works well beyond what is considered a traditional refuge boundary. The Friends Group strives to provide a foundation, forum, and framework to establish and facilitate diverse and creative partnerships that promote conservation, education, recreation, and economic opportunities within the watershed. Their successes and influences on conservation in the watershed are noteworthy and have drawn national attention (*https://www.facebook.com/pages/Friends-of-the-Silvio-O-Conte-National-Fish-and-Wildlife-Refuge/121976791147545?fref=nf;* accessed March 2015).

**NALCC Partnership**

Refuge lands will play a vital role in implementing the conservation actions identified by the NALCC partnership. This partnership includes the Service, other Federal agencies, States, Tribal governments, universities, and private organizations. The NALCC Development and Operations Plan details this partnership and identifies the plan's priorities (*http://www.fws.gov/northeast/science/pdf/NorthAtlanticLCCfinal.pdf;* accessed May 2014).

Implementation of the Connecticut River LCD Pilot Project, previously described, will also be a priority for the NALCC.

**Other Federal Agencies**
The refuge has several memorandums of understanding (MOU's) with other Federal agencies engaged in conservation in the watershed. The 2012 MOU establishing the watershed as a large landscape demonstration project under the Presidential initiative "America's Great Outdoors" includes nine Federal agencies: NRCS, U.S. Forest Service, Farm Service and Rural Development agency, DOT, NOAA, Department of Housing and Urban Development, EPA, and U.S. Army Corps of Engineers. The draft CCP/EIS, including this LPP, proposes to utilize the America's Great Outdoors framework to catalyze and bolster Federal agency partnerships to align, target, and leverage public resources to accomplish shared goals and objectives in the watershed.

**State Wildlife Agencies**
The Service and the four State fish and wildlife agencies in the watershed already work collaboratively to benefit many species and habitats. This proposal would support priorities for habitat protection and management in State WAPs and the outcomes and benefitting State WAP species are tracked and listed in CFA specific table in Attachment I. Species of greatest conservation need (GCN) have been identified in each of the four State plans: Connecticut (Connecticut Department of Environmental Protection Bureau of Natural Resources (CTDEEP) 2005), Massachusetts (Massachusetts Department of Fish and Game 2006), Vermont (Vermont Fish and Wildlife Department 2005), and New Hampshire (New Hampshire Game and Fish Department 2005). Almost without exception, the GCN species include those identified by the Service and are recognized by regional conservation partnerships (e.g., Joint Ventures) as priority resources of concern.

**Tribal Governments**
Native American Tribal Governments are important partners in the watershed. We will continue to pursue timely and effective collaboration in developing the CCP and protecting Native American cultural resources. Early in developing the Conte Refuge draft CCP/EIS, we contacted federally recognized Tribal governments with associations in the watershed to discuss issues, concerns, or opportunities they may have with existing or proposed refuge management. We also shared an internal review draft of the CCP/EIS. No issues or concerns related to land acquisition were expressed. The following Tribes were contacted:

- Narraganset Indian Tribe
- Mohegan Tribe of Indians of Connecticut
- Mashantucket Pequot Tribal Nation
- Wampanoag Tribe of Gay Head (Aquinnah)
- Mashpee-Wampanoag Tribe
- Stockbridge-Munsee Band of Mohican Indians

We will continue to engage and consult with Tribes throughout the planning and implementation phases of this project.

**Private-Public Conserved Lands Network in the Watershed**
As noted, the watershed has an extensive network of publically and privately conserved lands, totaling just over 1.8 million acres or 25 percent of the watershed. Conserved or "secured" lands in the watershed are lands that are permanently protected from development through fee title or easement restrictions, but in some cases may allow certain other land uses, such as farming and forestry. The conserved lands network is important to highlight because refuge lands are included, and because we have significant partnerships with other conservation land owners, especially those in proximity to refuge lands.

Within the watershed, many agencies, organizations, and private individuals own and maintain land included in the conserved lands network for a variety of different primary purposes. Those include: water supply, flood protection, timber production, agricultural use, recreational use, and fish and wildlife habitat. Some owners place a restriction on development simply for aesthetic reasons.

Table 8 presents the estimated conserved acres by state. It is important to note that there are likely small parcels held by municipalities, small land trusts, or private landowners that are not in the secured lands database yet, and more are being added all the time. While 25 percent of the watershed benefits from some form of conservation status; approximately half of these acres are situated in the desired system of

connected core areas that are more functionally resilient to the anticipated changes in climate and land use (attachment III).

**Table C.7. Conserved Lands in the Connecticut River Watershed by State**

| | Connecticut | Massachusetts | Vermont | New Hampshire | Totals |
|---|---|---|---|---|---|
| Federal | 428 | 11,149 | 215,699 | 238,173 | 465,450 |
| State | 78,407 | 345,013 | 172,236 | 150,742 | 746,399 |
| Local[1] | 42,820 | 78,478 | 26,398 | 48,898 | 196,595 |
| Private | 39,199 | 48,860 | 179,467 | 214,182 | 481,710 |
| Unknown[2] | 2,502 | 6,468 | 0 | 0 | 8,970 |
| **Totals** | **163,357** | **489,970** | **593,802** | **651,996** | **1,899,126** |

Sources: *CTDEEP Natural Resources Center (CT); Midstate Regional Planning Agency (CT); University of New Haven (CT); TNC (CT); MassGIS (MA); NH GRANIT (NH); Vermont Center for Geographic Information (VCGI) (VT); South Windsor Regional Planning Commission (VT); Northeastern Vermont Development Association; and the U.S. Fish and Wildlife Service.*

[1] *This includes city and town water supplies.*

[2] *This could not be determined from the data available.*

## VI. Implementing the Proposed Land Protection Strategy

### Service Land Acquisition Policy

It is the Service's policy and long standing practice to work with only willing sellers to acquire the minimum interest necessary to achieve our objectives. The Service's interest purchased can include fee-title or less-than-fee-title interest (e.g. easements and leases), and would be at market value. This approach has been modeled at the refuge over the past 15 years. A variety of different strategies were employed (fee title, easement, and use (term and life) reservations) to meet the resource protection objectives of the refuge in a manner that met the individual needs and preferences of the landowner.

The Service purchases land from willing sellers at market value, over time, as lands become available and only when funds are available and there is an agreement in terms and prices. Landowners are under no obligation to sell an interest in their properties to the Service, or change their practices or plans for their property due to location within an approved refuge acquisition boundary. In addition, owning land within an approved refuge acquisition area does not affect how the property owner can use their land or impact who the owner can sell their property to. In essence, defining the Service's areas of interest (e.g. a proposed CFA) authorizes the Service to be a "willing buyer" and an option to the landowner. The Service would strive to minimize the acquisition of infrastructure, unless the property is desirable for restoration purposes or is consistent with meeting other refuge goals or objectives.

### Prioritizing Parcels for Acquisition Within Proposed CFAs

Our acquisition activities will be informed and guided using priority rankings we have assigned them in this LPP. We evaluated and prioritized approximately 5,000 parcels within 21 proposed CFAs (Quonatuck CFA not included), and arranged the parcels into three priority categories or "tiers": Tier I, Tier II, and Tier III, with Tier I being the highest priority. Individual parcels range in size from about 1 acre to approximately 3,600 acres. In order to establish the tiered ranking system, we considered three criteria which we describe further below: the amount of priority species habitat within each parcel, the amount of wetlands, and the parcel size.

**Priority Habitat**

We first identified the three highest priority habitat types in each CFA based on the habitat's contribution to priority refuge resources of concern (draft CCP/EIS appendix A; also, see also table C.8). Below we present the considerations we used to prioritize areas and parcels for acquisition in this proposal. Our priorities were based on the following general considerations:

- Presence of suitable habitat for threatened and endangered species.
- Presence of suitable habitat for migratory birds in decline.
- Presence of important waterfowl habitat as identified by the ACJV.

Additional considerations include:

- Presence and amount of habitat for other species of conservation concern.
- Presence of riparian and floodplain forest.
- Connectivity in area, elevation, latitude, aspect, substrate, and process.
- Level of development, including buildings, roads, and other infrastructure.

These tiers will be primarily used if multiple landowners offer parcels of land in the proposed acquisition areas at the same time, and funding is insufficient to purchase all available parcels.

In order to establish the tier ranking by parcel, we considered three criteria: (1) amount of priority habitats; (2) presence of wetlands; and, (3) size of parcel.

**Table C.8. Priority I, II, and III Habitats in Each Proposed CFA**

| CFA | Priority I Habitats | Priority II Habitats | Priority III Habitats |
|---|---|---|---|
| Whalebone Cove CFA, Connecticut (3,786 acres) | Freshwater Marsh | Hardwood Forest | Shrub swamp and Floodplain Forest |
| Scantic River CFA, Connecticut (4,128 acres) | Floodplain Forest | Hardwood Swamp | Freshwater Marsh and Shrub Swamp |
| Salmon River CFA, Connecticut (3,699 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Freshwater Marsh |
| Salmon Brook CFA, Connecticut (2,770 acres) | Floodplain Forest (currently agriculture) | Grassland (currently agriculture) | Hardwood Swamp |
| Pyquag CFA, Connecticut (2,956 acres) | Floodplain Forest (currently agriculture) | Hardwood Swamp | Freshwater Marsh |
| Maromas CFA, Connecticut (3,935 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Pasture/Hay/Grassland |
| Farmington River CFA, Connecticut and Massachusetts (8,866 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Freshwater Marsh |
| Westfield River CFA, Massachusetts (6,520 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Conifer Swamp |
| Mill River CFA, Massachusetts (2,359 acres) | Floodplain Forest | Hardwood Swamp | Freshwater Marsh |
| Fort River CFA, Massachusetts (1,662 acres) | Floodplain Forest | Grassland | Hardwood Forest |
| Dead Branch CFA, Massachusetts (6,012 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Freshwater Marsh |
| Sprague Brook CFA, New Hampshire (3,016 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Freshwater Marsh |
| Pondicherry CFA, New Hampshire (10,242 acres) | Spruce-fir Forest | Peatland | Shrub Swamp and Floodplain Forest |
| Mascoma River CFA, New Hampshire (20,601 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Conifer Swamp |
| Blueberry Swamp CFA, New Hampshire (4,754 acres) | Spruce-fir Forest | Shrub Swamp and Floodplain Forest | Conifer Swamp |

| CFA | Priority I Habitats | Priority II Habitats | Priority III Habitats |
|---|---|---|---|
| Ashuelot River CFA, New Hampshire (17,753 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Freshwater Marsh |
| White River CFA, Vermont (10,031 acres) | Hardwood Forest | Pasture/Hay/Grassland | Cliff and Talus |
| West River CFA, Vermont (22,020 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Freshwater Marsh |
| Ottauquechee River CFA, Vermont (5,985 acres) | Hardwood Forest | Pasture/Hay/Grassland | Cliff and Talus |
| Ompompanoosuc River CFA, Vermont (15,071 acres) | Hardwood Forest | Shrub Swamp and Floodplain Forest | Pasture/Hay/Grassland |
| Nulhegan Basin CFA, Vermont (32,541 acres) | Spruce-fir | Shrub Swamp and Floodplain Forest | Peatland |
| Quonatuck CFA, Connecticut, Massachusetts, Vermont, and New Hampshire (8,000 acres) | Floodplain Forest | Tidal Marsh | Hardwood Swamp and Shrub Swamp |

**Priority Habitats**
We assessed each individual parcel within each CFA to determine how much of the parcel contains the priority habitats for the species of conservation concern identified for that CFA. We categorized parcels containing at least 67 percent priority habitats as "important habitat parcels." However, we were concerned that these criteria might not capture some larger parcels that still support significant amounts of priority habitat, but do not meet the 67 percent threshold. Therefore, we also categorized parcels that included at least 3 percent of all priority habitat for a particular CFA as "important habitat parcels[3]."

**Wetlands**
We next used National Wetlands Inventory data and USGS data to map wetlands, rivers, and streams, and then buffered each by 100 feet. Any parcel that contained at least 3 acres of buffered water and/or 3 acres of buffered wetland was categorized as an "important water parcel." Within the watershed, wetlands only account for 3 percent and open water only 2 percent of the habitat. Therefore, it is important to adequately protect these elements of the conservation mosaic in a manner that assures wetland and water quality and quantity for the benefit of wildlife and people.

**Parcel Size**
We used professional judgment to establish 5 acres as meaningful threshold on which to rank individual parcels. It is based on our experience that areas less than 5 acres, by themselves, can be challengings for effectively protecting, managing, or connecting habitat patches. A parcel is ranked lower if it is smaller than 5 acres.

**Determination of Tier I, II, or III rank**
Using the three criteria of habitat, wetlands, and parcel size, we then assigned a priority, or tier ranking, to each parcel. Tier I (highest priority) was assigned to parcels that were found to be important on all three criteria. Tier II was assigned parcels were important in two of the three criteria. Tier III was assigned to parcels important in one of the criteria. Table 9 below illustrates the assignment logic. An example of a parcel map for a CFA, and the respective parcel tier assignments that we are recommending, is presented in attachment II (map CII.1; table CII.1). CFA parcel maps and tier assignments for the approximately 5,000 parcels that comprise the full project are posted on our Website at *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html.*

[3] For example, assume a 10,000-acre CFA contains 7,000 acres of the three highest priority habitat types. Two of the parcels in this CFA are parcels A and B. Parcel A is 20 acres in size with 15 acres of priority habitat. This means that 75 percent of this parcel is priority habitat. Parcel A is an important habitat parcel because more than 67 percent of the parcel is priority habitat. Parcel B is 1,000 acres with 500 acres of priority habitat. This means that only 50 percent of this parcel is priority habitat and it does not meet the 67 percent threshold. However, Parcel B is also an important habitat parcel because it contains more than 3 percent of the priority habitat in the entire CFA (3 percent of 7,000 acres is 210 acres).

**Table C.9. Criteria Used to Establish Tier Designation for Each Parcel Proposed for Acquisition in Project**

| Important Habitat in Parcel[1] | Important Water or Wetlands in Parcel[2] | Parcel Size > 5 acres | Tier Designation for a Parcel |
|---|---|---|---|
| Yes | Yes | Yes | I |
| No | Yes | Yes | II |
| Yes | No | Yes | II |
| Yes | Yes | No | II |
| No | No | Yes | III |
| No | Yes | No | III |
| Yes | No | No | III |

[1] *Important Habitat Parcel: Any parcel that contains at least 67 percent of a priority CFA habitat type (re: table C.7), or that contains more than three percent of all priority habitat for a particular CFA.*

[2] *Important Water or Wetlands Parcel: Any parcel that contains at least three acres of water, including 100-foot buffer, and/or that contains three acres of wetlands, including 100-foot buffer.*

In addition to the priority criteria identified above, these other factors will also influence acquisition decisions:

- Availability of willing sellers.
- Availability of funding.
- Presence of infrastructure.
- Landowner needs.
- Operational efficiencies.
- Unforeseen site characteristics.
- Updated resource information and increased scientific knowledge.
- Proximity and connection to other conserved lands.
- Changes in habitat and other ecological conditions.
- Conservation status: we do not expect to purchase any lands already permanently conserved by others, except under extenuating circumstances.
- Presence of rare species and/or rare/imperiled habitat communities.
- Tangible threats to resources of concern.

The Service reserves the right to be flexible with the tier group rankings detailed above because, adhering to SHC principles, the identification and evaluation process is dynamic and must be adaptive to new or changing conditions. Smaller parcels, and parcels with significant improvements, development, and/or other alterations, will generally be eliminated from future consideration, unless protection is necessary to achieve restoration and management objectives within the surrounding landscape. In addition, the Service may need flexibility to meet the needs of individual landowners.

### Description of Land Protection Options Considered for Project

The following land protection options were considered as we developed our project proposal:

- Option 1: Landowner retains ownership and all use of property.
- Option 2: Management and/or land protection measures by others.

- Option 3: Less-than-fee-title acquisition (easement, lease, management agreement) by the Service.
- Option 4: Fee-title acquisition by the Service.

Option 1: Landowner Retains Ownership

Landowners who do not wish to convey their lands to the Service or another conservation entity may still like to improve their lands for wildlife. We may provide technical expertise or inform the landowner of voluntary incentive based programs offered by the Service or its partners to assist in habitat conservation. Landowners within a CPA or CFA would not be subject to any additional obligation or regulation due to their property's location within a proposed CPA or CFA.

Option 2: Management and/or Land Protection by Others

About 25 percent of the watershed is already under the stewardship of conservation partners via fee title, easement, leases, and/or management agreements. This option includes the diverse menu of partner initiatives that are intended to keep working farms and forests, restore wetlands and wildlife habitat, and promote and employ best management practices for land stewardship.

The U.S. Department of Agriculture has a very active easement program for private landowners in the watershed, historically offering the Forest Legacy Program (FLP), Farm and Ranchland Protection Program (FRPP), and the Wetland Reserve Enhancement (WRE) Program. USDA easement programs are diverse and typically well-funded, when compared to the Service's traditional land protection funding sources. For example, if a willing seller within a CFA would like to protect their forest as a working forest and manage it to produce lumber and to allow public access; the FLP may be the best option. If another willing seller who owns a farm that has residential development capacity reflected in the tax assessment, and they want to keep it as a working farm, an FRPP easement with USDA may be the best option.

We would promote the use of these USDA programs, as well as other Federal and State agency land conservation programs, across the watershed to support achieving Conte Refuge's legislated purposes, especially within CPAs and CFAs. Each of these voluntary and incentive based programs, and similar State and locally based conservation alternatives, are important conservation strategies to promote an integrated and sustainable working landscape. Management and protection of land and related resources by others will continue to add to the conserved lands network. This proposal could enhance the availability of watershed protection efforts by expanding the options available to the landowner, rather than compete or duplicate existing partner initiatives.

Option 3: Easements, Leases, and/or Management Agreements obtained by the Service

This option allows the Service to acquire a partial interest in lands through use of tools such as easements, leases, or cooperative agreements. This option employs long-term or permanent easements, renewable leases, and/or management agreements as a means of protecting and managing land to benefit fish and wildlife, and possibly providing wildlife-dependent recreational and educational opportunities. To date, the Service more frequently uses conservation easements, but short-term leases or management agreements have also been used effectively to protect or manage habitat on a temporary basis.

Specifically, conservation easements convey a partial, typically permanent, interest in land to the Service. Easement interests are acquired by the Service at market value from willing sellers to accomplish the purposes of the refuge. The underlying fee title to the property is retained by the landowner, leaving the parcel in private ownership. The Service and landowner agree to land-use practices that enable both to meet their conservation goals, as well as provide the landowner continued stewardship and use of these lands.

The Service would negotiate, on a case-by-case basis, the extent of the rights to acquire. Those may vary, depending on the configuration and location of the parcel, the current extent of development, habitat management requirements, the needs of the landowner, and other considerations. The structure of such easements will provide permanent protection of existing wildlife habitat while also allowing habitat management or improvements and access to sensitive habitats, such as for endangered species or migratory birds.

Where consistent with our management interests, we may also seek to acquire public access rights to secure wildlife-dependent recreational opportunities. However, the conveyance of any interest in land to the Service is up to the landowner. Easements are best employed by the Service as a conservation measure when:

- Only minimal management of the resource is needed, but there is a desire to ensure the continuation of current sustainable uses, wildlife habitat conditions, public access, and to prevent fragmentation over the long term.

- A landowner is interested in maintaining ownership of the land, does not want it to be further altered, and would like to realize the benefits of selling management rights, and/or public access rights.

- Properties subject to easements generally remain on the tax rolls, although the change in market value may reduce the assessment and ultimately the amount of property tax liability for the landowner. The Service does not pay refuge revenue sharing (i.e., funds the Service pays to counties and municipalities in lieu of taxes) on easement rights.

Other less-than-fee options include cooperative management agreements or leases, which convey management rights on a temporary basis. Similar to an easement, a lease represents an interest in the real estate for a specific period of time. Service easements are typically perpetual, while leases are temporary. The Code of Federal Regulations (CFR) can apply when the Service acquires interests in land via leases, similar to lands acquired in fee title or easement. For example, we could post the property and protect it as a national wildlife refuge for the duration of the lease, provided the appropriate clause was agreed to by the landowner (lessor) who is granting the lease.

Option 4: Fee Title Acquisition by the Service

This option includes the Service acquiring a full, fee title interest in land. A fee-title interest is normally acquired when: (1) the area's fish and wildlife resources require permanent protection not otherwise assured; (2) land is needed for visitor use development; (3) a pending land-use change may adversely impact the area's resources; (4) it is the most practical and economical way to assemble tracts into a manageable unit; or, (5) the landowner is not interested in retaining any interest in the property. Fee-title acquisition conveys all ownership rights to the Federal Government and provides the best assurances of permanent resource protection. A fee-title interest may be acquired by donation, transfer, or purchase when funds are available. We also have the authority to exchange land in Service ownership for other land that has greater habitat and/or wildlife value. Inherent in the land exchange option is the requirement to get dollar-for-dollar land value with, occasionally, an equalization payment. Exchanges are attractive because they usually do not increase Federal land holdings or require purchase funds. However, they also may be very complicated and take time to complete.

The fee title acquisition option provides us the most flexibility in managing priority lands, and ensuring perpetual protection of nationally significant trust resources and their habitat, and providing opportunities to engage the public through wildlife-dependent recreation and education opportunities. Generally, the lands the Service acquires will require some active management, including controlling invasive species, mowing or prescribed burning, planting, or managing for the compatible, priority public uses. In some cases, we may acquire fee interest on lands encumbered with a conservation easement, such as when an owner is interested in selling the remainder of interest in the land on which the Service or other partners have acquired an easement. We evaluate this need on a case-by-case basis and often in consultation with our partners, provided the landowner is agreeable to involving of others and the sharing of relevant or private details involved in the negotiations between the Service and the landowner.

### Land Protection Options Recommended for this Project

Our proposal includes a combination of Options 1, 2, 3, and 4. We believe this approach provides a range of flexible and cost-effective methods of implementing Service policy, while offering alternatives responsive to the preferences of local landowners interested in contributing to conservation, but who may or may not want to sell a full interest in their lands. We would also consider a donation as the opportunity arises, but this is difficult to anticipate and is not planned as part of our proposal.

A concerted effort will be made to acquire approximately 65 percent of the entire refuge in fee and the remaining 35 percent via easements, or other less-than-fee options. To date, fee title acquisition from willing sellers has been the Service's principal method of ensuring permanent protection of high priority habitats within refuge boundaries. However, we are finding that conservation easements are becoming more popular and appreciated by landowners who wish to conserve their properties, receive some financial benefits, and keep the land in traditional uses. To that end, and given the unique legislative mandate for this refuge, we

will emphasize the use of wildlife conservation easements for habitat management and/or public access for compatible outdoor recreation as an important tool of our land protection strategy.

Ultimately, it is the landowner who will determine what, when, or even if, land is purchased to become refuge. With available funding and an agreement in terms and price between the Service and the owner, land can be protected. The actual configuration of the purchase could include the whole parcel, a subdivision of the parcel, or only a portion of the ownership. Final action will be based on mutual agreement as to the type of protection strategy (fee or easement) employed. It is for these reasons and more, we estimate that an average of approximately 90 percent of the land identified within the CFAs will be conserved.

Further, should another Federal or State agency or organization administer a program that is more compatible with the desires of the landowner, the Service will strive to connect the landowner to those opportunities. Examples include the FLP and FRLP programs, and other easement, lease, and voluntary and incentive based protection options. This approach will be better for the landowner and allow the Service to expend its limited funds to protect lands that are most aligned with our Strategic Growth policy.

Once the landowner preference is identified and a description of what may be conveyed to the Service is described, an appraisal that meets stringent Federal requirements will be conducted. Willing-seller landowners interested in selling fee title ownership, easement, or sell a lease to the Service, and who give written permission, will initiate our process to work with the Department of the Interior's Office of Valuation Service to conduct, review, and approve an appraisal to determine market value. Once an appraisal has been approved, we can present an offer for the landowner's consideration. The Service is required by Federal law to offer 100 percent of the appraised market value or the interest in the property being conveyed; however, we can accept landowner offers of selling for less than the appraised value.

## VII. Project Costs and Funding

As of October 2013, approximately $31.4 million has been used to purchase the current 35,921 acres of refuge lands. These funds were used to pay for direct land costs, plus incidental real estate expenses to cover appraisals, surveys, title work, and relocation expenses; resulting in an average $872 per acre acquisition cost since the refuge was first established on October 3, 1997.

Using the previous per acre value, the proposed 99,916-acre refuge increase could increase the project cost by approximately $87.1 million. Based on our financial capacity over the past fifteen years, it could take another 50 years to acquire the entire project. A long-term commitment of this nature is not at all uncommon when compared to the status of other Refuge System land protection projects, and in light of our willing-seller-only approach.

The legislated purposes in the Conte Refuge Act create both an opportunity and a justification for other Federal agencies to participate and leverage their human and financial resources within a partnership context, and in support of mutually-beneficial programmatic and landscape agency goals. These resources could be focused on public or private land within a CPA or CFA, and augment the efforts and accomplishments by the Service and many other partners.

There are many sources of funding that could be pursued to achieve conservation objectives and outcomes that contribute toward the refuge's legislated purposes. Sources of land conservation funding could be derived from: Land and Water Conservation Fund, Migratory Bird Conservation Fund, North American Wetlands Conservation Fund, State Wildlife Grants, FLP and FRPP funds, WRE, and State conservation dollars. In addition, habitat restoration could be accomplished using: Partners for Fish and Wildlife Funds, Habitat Recovery Grants, State Wildlife Grants, Wildlife Habitat Incentive Program, Environment Quality Investment Program, and Coastal Program Funds. Further, additional resource accomplishments could be realized using DOT funding and EPA funding. While many of these funding sources would not be applied toward our appropriation ceiling, they could stimulate vital resource accomplishments and decrease Service costs as well as many more options for the landowners.

## VIII. Proposed Management Direction Under Service Ownership

### Land Management Direction

Emphasis will be on promoting habitat that improves and sustains biological diversity, integrity, and ecological function within habitat communities listed below. Additional details are available by CFA in the refuge's draft CCP/EIS appendix A which details priority species, habitat targets (type and amount), and related management objectives and strategies. Below we present the general management objective for major habitat types which are outlined in more detail in the draft CCP/EIS appendix A.

*Forested Upland and Wetland*–Protect, manage, and/or restore forested acres within the watershed to assemble resilient forest blocks valuable to conservation targets (i.e. migratory birds of conservation concern).

*Riparian Habitat and Floodplain Forest*–Protect, manage, and/or restore priority riparian areas, including forested floodplains and river and stream banks to promote habitat connectivity, migration and emigration corridors, and water quality.

*Shrub and Grassland*–Protect, manage, and/or restore grasslands and shrublands, consistent with site capability, within the watershed to support early successional dependent migratory bird species and NEC.

*Agricultural Land* –Support the conservation and sustainable use of agricultural land within the watershed to reduce the permanent loss or degradation of current and potential wildlife habitat.

*Non-forested Wetlands*–Protect, manage, and/or restore non-forested wetlands, including shrub swamps, peatlands, herbaceous marshes, and wet meadows to benefit declining migratory birds.

*Water Resources (Rivers, Streams, Lakes, and Ponds)*–Protect and restore water quality and in-stream structure, function, and process within the river mainstem and its tributaries, and lakes and ponds to benefit aquatic species, including federally listed threatened and endangered species.

*Tidal Wetlands and Adjoining Uplands (Salt, Brackish, and Fresh)* –Protect, maintain, and restore tidaly influenced wetlands in the watershed to benefit migrating and wintering waterfowl and other migratory bird species and allow for their landward migration due to climate change.

As land is acquired from willing sellers and becomes a manageable unit, CFA specific habitat management plans will be developed in consultation with the public, partners, and other stakeholders. Species and habitats will be managed to protect ecosystem structures and functions in an effort to provide viable habitat for wildlife in the face of climate and land use changes.

In appendix A, we also detail our general management direction for enhancing environmental, interpretive, and outreach programs and their delivery on refuge lands, while also continuing to expand opportunities off-refuge using the WoW Express, "Biological Assessment Trailer", Adopt-a-Habitat program, "Conte Corners" and private lands program. In appendix A, we also emphasize our intent to continue robust hunting and fishing programs consistent with state regulations when deemed compatible, and to provide other outdoor recreational opportunities that provide quality, nature-based experiences, and which foster an appreciation for conserving natural resources and garner support for the Refuge System.

## IX. Special Considerations

### Conservation Plans and Initiatives Guiding Development of the LPP

This proposal will contribute to a variety of important ecoregional landscape plans and partnership initiatives that include the ACJV Implementation Plan and the Black Duck Joint Venture Strategic Plan of the NAWMP, the Northern Atlantic Regional Shorebird Plan, the Waterbird Conservation Plan for the Mid-Atlantic/New England/Maritimes Region, the BCR 14 and 30 Plans, and the State WAPs in Connecticut, Massachusetts, New Hampshire, and Vermont. In all, we consulted over 60 other plans to help develop the land protection actions outlined in this proposal. The myriad of plans confirms the importance of the watershed to many governmental and non-governmental conservation organizations. These plans range from watershed-wide conservation plans to species-specific recovery plans, representing all major taxa, both terrestrial and aquatic. They are summarized in appendix M of the refuge's Draft EIS/CCP.

### International, National, Regional, and State Designations

Landscape conservation actions within the watershed date back to at least 1952 when the Connecticut River Watershed Council was created. Since that time, the watershed has been the subject of attention by many diverse agencies and organizations that recognize its significance as a landscape worth conserving. International, national, and state conservation and recreation designations recognize many attributes within the watershed for exceptional, high quality wildlife and fish habitat, as recreation destinations, for its working landscapes and many cultural and historic resources, including:

- The river and the watershed was designated by the Secretary of the Interior as the Nation's first, and only, National Blueway on May 24, 2012.
- The river was designated as an American Heritage River on July 30, 1998.
- The tidal wetlands complex in the vicinity of where the river meets the Long Island Sound was designated as a Ramsar Wetland of International Importance (under the Ramsar Convention) on October 14, 1994.
- Eleven areas with high quality habitat that are vital to birds and other biota are recognized by the National Audubon Society as Important Bird Areas (IBA). There is at least one IBA in each of the four States within the watershed. The refuge's Pondicherry and Nulhegan Basin Divisions include recognized IBAs.
- The river mainstem, from the Massachusetts stateline north to about Claremont, New Hampshire, is a NAWMP focus area and an IBA.
- Three areas in the watershed are designated as National Natural Landmarks, including a portion of the refuge's Pondicherry Division.
- The watershed is also a focus for the NALCC, the Northeast Region of the Service, and it is part of one of the five (5) large iconic landscapes identified by the Administration and a focus for the DOI, Department of Agriculture, and the Army Corps of Engineers.

## X. Socioeconomic and Cultural Impacts

### Socioeconomic Impacts

We do not predict significant adverse socioeconomic or cultural impacts as a result of this proposal or other components of the Service-preferred alternative C in the draft CCP/EIS. We anticipate there will be an overall positive effect on the socioeconomic environment as a result of the action outlined in this document. If the Service protects lands identified in this proposal over an extended period (decades) of time, we believe positive benefits for communities in the watershed will include: increased property values in the vicinity of the conserved properties, increased watershed protection, maintenance of many traditional uses, increased opportunities for outdoor public use activities, and increased revenues for local businesses from refuge visitors who participate in hunting, fishing, and wildlife observation. Recreational use on national wildlife refuges nationally generated almost $2.4 billion in total economic activity during fiscal year 2011, according to the Service's *Banking on Nature 2013: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation* report (Carver and Caudill 2013).

According to the Banking on Nature study, nearly 46.5 million people visited national wildlife refuges in 2011, supporting almost 35,000 jobs and producing about $793 million in employment income. In addition, recreational spending on refuges generated nearly $343 million in tax revenue at the local, county, State, and Federal levels. An estimated 87 percent of refuge visitors travel from outside the local area (Carver and Caudill 2013).

The potential exists for some adverse impacts, namely a potential decline in tax revenue to local governments (as lands come under Service ownership). However, this decline may or may not occur, since those lost tax revenues will be offset partially by the Refuge Revenue Sharing (RRS) Program (*http://www.fws.gov/refuges/realty/rrs.html;* accessed May 2014). Funding of the RRS program will be dependent on future congressional appropriations.

For refuge CCP planning, we enlisted the assistance of economists with the USGS, Fort Collins Science Center, to assess the economic impact of the alternatives evaluated in the draft CCP/EIS, including this land protection proposal. The full report is included as appendix I of the draft CCP/EIS. Among other details and analysis, the report includes a description of the current economic setting and illustrates the refuge's economic contribution to local communities. The refuge management activities of greatest, direct economic impact in the watershed are:

- Refuge purchases of goods and services within the local communities.
- Refuge staff salary spending.
- Refuge visitor spending in the local communities.
- Revenues generated from timber harvesting for habitat management on the refuge.
- Refuge land purchases and changes in local tax revenue.

The USGS economic report focuses on describing and assessing six focal sub-regions within the watershed. The sub-regions incorporate 11 counties that make up the bulk of the watershed and are central to the refuge's existing and proposed future land base. The sub regions described are:

Northern Sub-Region: Essex County, Vermont, and Coos County, New Hampshire.

- White River Junction Sub-Region: Orange County, Vermont, Windsor County, Vermont, and Grafton County, New Hampshire.
- Tri-State Border Sub-Region: Windham County, Vermont, Cheshire County, New Hampshire, and Franklin County, Massachusetts.
- Greater Amherst Sub-Region: Hampshire County, Massachusetts.
- Greater Hartford Sub-Region: Hartford County, Connecticut.
- Southern Connecticut Sub-Region: Middlesex County, Connecticut.

Section 1 of the USGS report provides a description of the various regional economies and select local communities that comprise the watershed and specific management areas for the refuge. Section 2 is a qualitative discussion regarding the current and potential economic and fiscal impacts generated by the refuge from additional land acquisition. It also provides an in-depth discussion of ecosystem services and relative values in a qualitative manner, which we summarize below. Section 3 describes the methods used to conduct a regional economic impact analysis, followed by an analysis of the draft CCP/EIS management strategies that could affect the local economy.

The report quantifies current contributions of the refuge to regional economies, but emphasizes that the economic impacts from additional land acquisition are highly dependent on the timing, amount, and distribution of those acquisitions. With the high level of uncertainty, and the many variables at play, it is not possible to precisely predict the economic impacts from a refuge expansion thus they are presented qualitatively. The authors predict that over time, any possible losses in local government revenues from property taxes, or from losses from agricultural and forestry production, will be at least partially offset by the gains from refuge management activities and spending within other economic sectors (food, recreation, and other service sectors) generated through refuge visitation. There is no expectation of a significant impact on the economies of any subregion as a result of the proposed refuge expansion. However, in some of the more forestry based economies, it could result in some diversification in the economic base in the service sectors.

While quantifying individual ecosystem service values was beyond the scope of their report, USGS authors report notes that the economic value of a refuge encompasses more than just the direct impacts to the regional economy. Refuges and other conservation areas also provide substantial nonmarket values (values for items not exchanged in established markets) such as conserving threatened and endangered species, preserving

wetlands, developing future generations of citizen stewards and outdoor enthusiasts, and adding stability to the ecosystem (Caudill and Henderson 2003). Other services include water supply and quality, flood protection, aesthetic beauty, and quality of life values. These natural "services" provided by the conserved landscape can be extremely valuable to one's well-being and to society. A study by Ingraham and Foster (2008) attempted to value the bundle of ecosystem services provided by national wildlife refuges in the contiguous U.S. The authors determined that various habitats within the Refuge System were providing services valued at $32.3 billion (2011 dollars) per year, or an average of $2,900 per acre per year. As such, these ecosystem service values can be substantial and should not be overlooked or underestimated.

### Cultural Resources

Refuge lands will increase protection for cultural resources in the area. Service ownership will protect unidentified or undeveloped cultural sites from disturbance or destruction. Partnering with Native American Tribal Governments will aid in identifying and protecting sites, cultural landscapes, and specific biota of importance to the tribe(s). Potential interpretation and environmental education programs could continue to promote public understanding and appreciation of the area's rich cultural resources. Taken together, we believe there to be a net positive effect to the cultural and historic resources of the region.

### Impacts on Other Community Resources

Many other values associated with the lands and waters in the watershed are important to communities. We mention below four that would be protected and enhanced through our proposal.

#### Historical and Cultural Conservation

The river has a long and storied history in the development of both Native and settlement cultures and played a pivotal role in the development of New England's rural commerce. The proposal is respectful of the working landscape tradition and the New England Governors' recent compact to sustain forestry and agriculture as a priority within this large working landscape.

#### River and Riparian Conservation and Restoration

The river is perhaps New England's richest, bordered by some of the region's most productive soils and floodplain forest habitat. Consistent with the refuge's legislated purposes, the removal of barriers to the passage of aquatic species and improvements to aquatic and riparian habitat, are a prominent and priority focus for the refuge on public and private land. In addition, a concerted public and private partnership effort will be made to restore riparian forest, floodplain forests, and natural water regimes (quality, rate, and timing) within the watershed.

#### Recreational Opportunities

Providing and maintaining recreational opportunities, especially access to the river, is of paramount concern to local communities. This would be a priority on lands within our proposal, as it has been to-date on existing refuge lands. We would also continue to provide opportunities for fishing, hunting, wildlife observation, photography, environmental education, and interpretation. Snowmobiling is very popular in various regions of the watershed, and is permitted on refuge lands, where appropriate, compatible, and where the trail is part of an existing State-recognized trail system.

The proposal would enhance protection of the Appalachian Trail which meanders through the northern-half of the watershed, making its way through the impressive White Mountain National Forest in New Hampshire. Land acquisition would also enhance tourism in local communities. The middle portion of the watershed in Massachusetts is bordered by the Berkshire Mountains to the west, which have been attracting tourists and recreationists for decades. Towns in the southern portion near the mouth of the river heavily promote recreation opportunities associated with saltwater experiences.

Expanding Service ownership would increase public opportunities for appropriate and compatible wildlife-dependent recreation. In particular, hunting, fishing, wildlife observation, nature photography, environmental education, and interpretation would be encouraged where compatible. Increased recreational opportunities on and adjacent to refuge land could protect a dependable destination to accommodate the demand for traditional outdoor activities, maintaining elements of the local culture while attracting visitors, and potentially, an additional source of revenue for local and regional economies.

# XI. Public Review of Proposal

## Public Scoping

The Service recognizes that effective and responsive conservation begins with community involvement. We announced the initiation of the Conte Refuge draft CCP/EIS and a public scoping and comment period through a *Federal Register* notice of intent on October 11, 2006. During this step, we sought public involvement in the planning process. From the responses we received, we developed a list of points of interest, challenges, opportunities, or any other item requiring a management decision.

During the public and partner scoping period we used the following techniques to ensure we reached out to a wide variety of stakeholders and obtain all of the points of interest, challenges, and opportunities identified by the public, our conservation partners, and other Service program staff:

- An "issues workbook" which asked recipients questions about their interest and concerns related to the refuge.
- Public scoping meetings held throughout the watershed where we explained the planning process and gathered comments. We held 9 meetings in the fall of 2006 and then another 12 in the winter of 2007 to 2008.
- CCP planning team meetings with State representatives and invited guest experts to share information.
- Meetings sponsored by the Friends of Conte Refuge.
- Meetings to coordinate with other Service programs and other Federal and State agencies.
- Conversations between staff and individuals or groups.

## Public Review and Comment of Proposal

The Draft EIS/CCP and LPP will be made available for public review and comment for a period of 90 days. Concurrently, a series of information meetings will be convened in the vicinity of CFAs to afford an opportunity for the affected public to ask questions and obtain additional information. In addition, a public hearing will be held in each of the four states in the watershed.

The public will be able to submit comments by one of the following methods:

(1) Electronically via the Federal eRulemaking Portal: *http://www.regulations.gov*. In the "Search" box, commenters will enter the docket number for this project. Comments can be submitted by clicking on "Comment Now!" Attachments can be made to the electronic comment form.

(2) By hard copy via U.S. mail or hand-delivery to: Public Comments Processing, Attn: [FWS-R5-NWRS-2015-0036]; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

(3) Via oral public testimony at one of the four public hearings that will be scheduled; e.g. one hearing per state.

Our request will be to send comments only by one of the methods described above. All comments will be posted to *http://www.regulations.gov* and will be viewable by anyone accessing the site. This generally means that we will post any personal information you provide us.

**All public comments will be treated the same regardless of how they were submitted.**

Comments received during the comment period will be used to revise and refine the final CCP/EIS and LPP. The Service's response to public comments will be provided as an appendix to the final plan. The final CCP/EIS will be distributed for an additional 30-day review period. The availability of the draft and final documents, and information on the respective comment periods, will be published as a notice in the Federal Register. After the final CCP/EIS has undergone a 30-day review, our Director can make a decision on this project proposal.

# Attachment I

## Proposed Land Protection Plan for Silvio O. Conte National Fish and Wildlife Refuge Contributions of Plan to Waterfowl and other Migratory Bird Objectives

In this attachment, we provide estimates of the potential number of breeding birds that could be supported within the proposed Conte Refuge CFAs and the acres of potentially suitable breeding habitat within those proposed CFAs. These CFAs are included as part of the refuge's draft CCP/EIS Service-preferred alternative C. We provide these estimates for six neotropical migrant species that are: (1) identified as Priority Refuge Resources of Concern; (2) are identified as priority species within BCR plans; and, (3) represent the range of upland and wetland habitat types within the CFAs. The six species are:

- Wood thrush.
- Canada warbler.
- Blackburnian warbler.
- Black-throated blue warbler.
- American woodcock.
- Bobolink.

Four of these six species (wood thrush, blackburnian warbler, American woodcock, and bobolink) have been identified as representative (also referred to as "surrogate") species by the NALCC. In addition to the breeding neotropical migrants, we identify potential contributions of the CFAs to waterfowl habitat, American black duck and wood duck breeding populations, and neotropical migrant stopover habitat.

We also present population estimates and acres of potentially suitable habitat contributed by existing conserved lands within the watershed. Looking at existing conserved lands provides perspective on what additional migratory bird benefits would be provided to the conservation estate by acquiring the proposed lands within the CFAs. We compare our estimates for the CFAs and conserved lands to population and habitat objectives that have been established at the BCR and State scales as reported in the BCRs 14 (Atlantic Northern Forest–*http://www.acjv.org/bcr14.htm;* accessed May 2014) and 30 (New England–Mid-Atlantic Coast - *http://www.acjv.org/bcr30.htm;* accessed May 2014) or the Partners in Flight North American Landbird Conservation Plan (*http://www.partnersinflight.org/cont_plan/;* accessed May 2014*).*

Bird population estimates were derived by applying published density estimates by habitat types (e.g., from the Birds of North America species accounts) to the acres of the different habitat types occurring within the CFAs. We have also included in our analyses the 8,000 acres of undesignated lands to be part of the Quonatuck CFA by assuming that these lands will represent approximately 1,500 acres of tidal marsh and floodplain habitat along the mouth and lower extremities of the river in Connecticut, approximately 1,500 acres of floodplain forest along the river and major tributaries in Massachusetts, and approximately 5,000 acres of floodplain forest along the upper portion of the river and major tributaries and distributed evenly between New Hampshire and Vermont. We typically used numbers at the lower end of the range of published density estimates because high densities usually reflect the most suitable habitat but we are trying to estimate populations across the landscape, which will include a range of habitat quality. We also acknowledge that the published bird population objectives typically reflect relatively low densities at landscape scales, and we wanted our estimates to be as comparable with those objectives as possible.

### Summary of Proposed Conte Refuge Land Acquisition Contributions to Migratory Birds

The proposed land acquisition by Conte Refuge under the draft CCP/EIS alternative C will make significant contributions to state-level breeding population objectives for several neotropical migrants and toward overall waterfowl habitat objectives as well as toward breeding habitat for two high priority waterfowl species. We evaluated the potential for this proposal to benefit four neotropical migrant birds. For the wood thrush and Canada warbler, the proposed acquisitions could potentially meet 2 to 11 percent of the four States' breeding population objectives. For the black-throated blue warbler, we estimate that the proposed land acquisition within the CFAs could potentially contribute 10 to 20 percent of the State's breeding population objectives. For the blackburnian warbler, our proposal could contribute between 4 to 12 percent of the State's objectives.

The proposed land acquisition would also make significant contributions to the habitat objectives for three waterfowl focus areas identified in the ACJV's Waterfowl Implementation Plan: the Connecticut River and Tidal Wetlands Complex Focus Area in Connecticut, the Connecticut River Focus Area in New Hampshire

and Vermont, and the Lake Memphremagog Focus Area in northern Vermont. The proposed land acquisition will also protect significant breeding habitat for American black duck and wood duck, potentially supporting approximately 1,000 and 4,000 breeding pairs, respectively.

In addition, a study of neotropical migrant habitat use during migration suggests that habitat protection within the watershed will have significant benefits for supporting neotropical migrants during the spring migratory period, especially forest and shrub wetlands along the mainstem of the river.

**A. Wood thrush**

Through the acquisition of the proposed lands within CFAs in the watershed, Conte Refuge lands would provide approximately 155,450 acres of deciduous and mixed upland forests and forested wetlands representing potentially suitable habitat for wood thrush. With protection and appropriate management (to be specified in refuge habitat management plans), these acres have the potential to support an estimated wood thrush population of 31,180 birds. With protection and appropriate management within the network of conserved lands in the watershed, the network could potentially support an estimated wood thrush population of 273,145 birds on 1,362,025 acres of potentially suitable habitat for this species. Breaking these bird population and habitat numbers down by BCRs and comparing them to established population and habitat objectives for BCRs 14 and 30 results in the following comparisons:

| **Wood thrush** | **BCR 14**[1]<br>Population Objectives. = 1,462,100<br>Habitat Objectives = 9,031,900ac | **BCR 30**[2]<br>Population Objectives = 825,000<br>Habitat Objectives = 6,875,000ac |
|---|---|---|
| ***Population Estimates***<br>(# of individuals) | | |
| Estimated population on all **CFAs** | 26,040 | 5,138 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 1.8% | 0.6% |
| Estimated population on all **Conserved Lands** | 250,010 | 23,135 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 17% | 2.8% |
| ***Acres of Habitat*** | | |
| Acres of potentially suitable habitat on **CFAs** | 112,085 | 43,365 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 1.2% | 0.6% |
| Acres of potentially suitable habitat on **Conserved Lands** | 1,263,710 | 98,315 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 14% | 1.4% |

[1] *Population and habitat objectives from the BCR 14 Bird Conservation Plan.*
[2] *Population and habitat objectives from the BCR 30 Bird Conservation Plan.*

The proposed CFAs will provide a disproportionately large contribution to the BCR14 population and habitat objectives for wood thrush. The total proposed CFA acreage only represents 0.2 percent of total acres in BCR 14,

but will contribute 1.2 percent of the BCR 14 wood thrush habitat objective and 1.8 percent of the BCR 14 wood thrush population objective.

We also provide the following breakdown of these bird population and habitat numbers for wood thrush by state:

| **Wood thrush** | **Connecticut** Population Objectives = 150,000<br><br>Habitat Objectives = 1,250,000ac | **Massachusetts** Populations Objectives = 155,000<br><br>Habitat Objectives = 957,510ac | **New Hampshire** Population Objectives = 200,910<br><br>Habitat Objectives = 1,241,120ac | **Vermont** Population Objectives = 242,390<br><br>Habitat Objectives = 1,497,365ac |
|---|---|---|---|---|
| ***Population Estimates*** (# of individuals) | | | | |
| Estimated population on all **CFAs** | 5,138 | 3,915 | 9,505 | 13,300 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 3.4% | 2.5% | 4.7% | 5.5% |
| Estimated population on all **Conserved Lands** | 23,130 | 77,035 | 77,590 | 91,715 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 15% | 50% | 39% | 38% |
| ***Acres of Habitat*** | | | | |
| Acres of potentially suitable habitat on **CFAs** | 43,365 | 19,565 | 47,170 | 65,865 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 3.5% | 2.0% | 3.8% | 4.4% |
| Acres of potentially suitable habitat on **Conserved Lands** | 98,315 | 387,990 | 383,900 | 453,740 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 7.9% | 41% | 31% | 30% |

**B. Canada warbler**

Through the acquisition of the proposed lands within CFAs in the watershed, Conte Refuge lands would provide approximately 209,910 acres of upland forests, forested wetlands, and shrub wetlands representing potentially suitable habitat for Canada warbler. With protection and appropriate management (to be specified in habitat management plans), these acres have the potential to support an estimated Canada warbler population of 4,790 birds. With protection and appropriate management within the conserved lands network in the watershed, the network could potentially support an estimated Canada warbler population of 42,170 birds on 1,656,725 acres of potentially suitable habitat for this species. Breaking these bird population and habitat numbers down by BCR and comparing them to established population and habitat objectives for BCRs 14 and 30 results in the following comparisons:

| Canada warbler | **BCR 14**[1]<br>Pop. Obj. = 272,600<br>Habitat Obj. = 11,937,630ac | **BCR 30**[2]<br>Pop. Obj. = 6,000<br>Habitat Obj. = 235,720ac |
|---|---|---|
| ***Population Estimates***<br>(# of individuals) | | |
| Estimated population on all **CFAs** | 4,300 | 490 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 1.6% | 11% |
| Estimated population on all **Conserved Lands** | 40,030 | 2,140 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 15% | 48% |
| ***Acres of Habitat*** | | |
| Acres of available habitat on all **CFAs** | 165,800 | 44,050 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 1.4% | 22% |
| Acres of available habitat on all **Conserved Lands** | 1,558,575 | 98,150 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 13% | 50% |

[1] *Population objective from the BCR 14 Bird Conservation Plan; habitat objective calculated based on estimated densities from published studies.*

[2] *Population objective from the PIF Landbird Conservation Plan and PIF population estimates database; habitat objective calculated based on estimated densities from published studies*

We also provide the following breakdown of these bird population and habitat numbers for Canada warbler by state:

| Canada warbler | **Connecticut**<br>Pop. Obj. = 4,500<br>Habitat Obj. = 197,065ac | **Massachusetts**<br>Pop. Obj. = 12,000<br>Habitat Obj. = 473,289 | **New Hampshire**<br>Pop. Obj. = 30,000<br>Habitat Obj. = 1,178,600 | **Vermont**<br>Pop. Obj. = 28,500<br>Habitat Obj. = 1,119,675 |
|---|---|---|---|---|
| ***Population Estimates***<br>(# of individuals) | | | | |
| Estimated population on all **CFAs** | 490 | 455 | 1,520 | 2,295 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 11% | 3.8% | 5.1% | 8.1% |
| Estimated population on all **Conserved Lands** | 2,140 | 9,410 | 15,265 | 14,520 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 48% | 78% | 51% | 51% |

| Canada warbler | **Connecticut** Pop. Obj. = 4,500 Habitat Obj. = 197,065ac | **Massachusetts** Pop. Obj. = 12,000 Habitat Obj. = 473,289 | **New Hampshire** Pop. Obj. = 30,000 Habitat Obj. = 1,178,600 | **Vermont** Pop. Obj. = 28,500 Habitat Obj. = 1,119,675 |
|---|---|---|---|---|
| ***Acres of Habitat*** | | | | |
| Acres of potentially suitable habitat on **CFAs** | 44,050 | 20,175 | 58,470 | 87,155 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 22% | 3.8% | 4.5% | 7.0% |
| Acres of potentially suitable habitat on **Conserved Lands** | 98,150 | 400,410 | 582,870 | 560,760 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 50% | 85% | 49% | 50% |

**C. Blackburnian warbler**

Through the acquisition of the proposed lands within CFAs in the watershed, Conte Refuge lands would provide approximately 182,525 acres of coniferous and mixed upland forests representing potentially suitable habitat for blackburnian warbler. With protection and appropriate management (to be specified in habitat management plans), these acres have the potential to support an estimated blackburnian warbler population of 26,580 birds. With protection and appropriate management within the conserved lands network in the watershed, the network could potentially support an estimated blackburnian warbler population of 232,720 birds on 1,636,020 acres of potentially suitable habitat for this species. Breaking these bird population and habitat numbers down by BCRs and comparing them to established population and habitat objectives for BCRs 14 and 30 results in the following comparisons:

| Blackburnian warbler | **BCR 14**[1] Pop. Obj. = 850,000 Habitat Obj. = 14,002,330ac | **BCR 30**[2] Pop. Obj. = 8,000 Habitat obj. = 494,200ac |
|---|---|---|
| ***Population Estimates*** (# of individuals) | | |
| Estimated population on all **CFAs** | 26,070 | 508 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 3.1% | 6.4% |
| Estimated population on all **Conserved Lands** | 231,640 | 2,160 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 27% | 27% |
| ***Acres of Habitat*** | | |
| Acres of potentially suitable habitat on all **CFAs** | 139,285 | 43,240 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 1.0% | 8.7% |
| Acres of potentially suitable habitat on **Conserved Lands** | 1,539,915 | 96,110 |
| Percent (%) of BCR habitat objective contributed by **Conserved Lands** | 11% | 19% |

[1] *Population objective from the PIF Landbird Conservation Plan and PIF population estimates database; habitat objective calculated based on estimated densities from published studies.*

[2] *Population objective from the PIF Landbird Conservation Plan and PIF population estimates database; habitat objective calculated based on estimated densities from published studies.*

The proposed CFAs will provide a disproportionately large contribution to the BCR14 population and habitat objectives for blackburnian warbler. The total proposed CFA acreage only represents 0.2 percent of total acres in BCR 14, but will contribute 1.0 percent of the BCR 14 wood thrush habitat objective and 3.1 percent of the BCR 14 wood thrush population objective.

We also provide the following breakdown of these bird population and habitat numbers for blackburnian warbler by state:

| **Blackburnian warbler** | **Connecticut** Pop. Obj. = 8,000 Habitat Obj. = 494,200ac | **Massachusetts** Pop. Obj. = 80,000 Habitat Obj. = 1,317,870ac | **New Hampshire** Pop. Obj. = 170,000 Habitat Obj. = 2,800,470ac | **Vermont** Pop. Obj. = 110,000 Habitat Obj. = 1,812,070ac |
|---|---|---|---|---|
| ***Population Estimates*** (# of individuals) | | | | |
| Estimated population on all **CFAs** | 510 | 3,035 | 8,760 | 12,780 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 6.4% | 3.8% | 5.2% | 12% |
| Estimated population on all **Conserved Lands** | 2,160 | 58,390 | 78,980 | 82,630 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 27% | 73% | 46% | 75% |
| ***Acres of Habitat*** | | | | |
| Acres of potentially suitable habitat on **CFAs** | 43,240 | 19,500 | 56,380 | 84,810 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 8.7% | 1.5% | 2.0% | 4.7% |
| Acres of potentially suitable habitat on **Conserved Lands** | 96,110 | 392,615 | 564,870 | 543,725 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 19% | 30% | 20% | 30% |

**D. Black-throated blue warbler**

Through the acquisition of the proposed lands within CFAs in the watershed, Conte Refuge lands would provide approximately 182,720 acres of deciduous and mixed upland forests representing potentially suitable habitat for black-throated blue warbler. With protection and appropriate management (to be specified in habitat management plans), these acres have the potential to support an estimated black-throated blue warbler population of 25,410 birds. With protection and appropriate management within the conserved lands network in the watershed, the network could potentially support an estimated black-throated blue warbler population of 216,940 birds on 1,478,170 acres of potentially suitable habitat for this species. Breaking these bird population and habitat numbers down by BCRs and comparing them to established population and habitat objectives for BCRs 14 and 30 results in the following comparisons:

| **Black-throated blue warbler** | **BCR 14**[1]<br>Pop. Obj. = 565,680<br>Habitat Obj. = 9,318,619ac | **BCR 30**[2]<br>Pop. Obj. =5,000<br>Habitat Obj. = 308,875ac |
|---|---|---|
| ***Population Estimates***<br>(# of individuals)) | | |
| Estimated population on all **CFAs** | 24,200 | 1,210 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 4.3% | 24% |
| Estimated population on all **Conserved Lands** | 214,300 | 2,640 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 38% | 53% |
| ***Acres of Habitat*** | | |
| Acres of potentially suitable habitat on all **CFAs** | 140,410 | 42,310 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 1.5% | 14% |
| Acres of potentially suitable habitat on **Conserved Lands** | 1,381,430 | 96,740 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 15% | 31% |

[1] *Population objective from the BCR 14 Bird Conservation Plan; habitat objective calculated based on estimated densities from published studies.*

[2] *Population objective from the PIF Landbird Conservation Plan and PIF population estimates database; habitat objective calculated based on estimated densities from published studies.*

The proposed CFAs will provide a disproportionately large contribution to the BCR14 and BCR 30 population and habitat objectives for black-throated blue warbler. The total proposed CFA acreage only represents 0.2 percent of total acres in BCR 14, but will contribute 1.5 percent of the BCR 14 black-throated blue warbler habitat objective and 4.3 percent of the BCR 14 black-throated blue warbler population objective. Similarly, the total proposed CFA acreage represents 0.1 percent of BCR 30, but will contribute 9.8 percent of the BCR 30 black-throated blue warbler habitat objective and 17 percent of the BCR 30 black-throated blue warbler population objective.

We also provide the following breakdown of these bird population and habitat numbers for black-throated blue warbler by state:

| **Black-throated blue warbler** | **Connecticut** Pop. Obj. = 7,000 Habitat Obj. = 432,425ac | **Massachusetts** Pop. Obj. = 30,000 Habitat Obj. = 494,200ac | **New Hampshire** Pop. Obj. = 60,000 Habitat Obj. = 988,400 | **Vermont** Pop. Obj. = 60,000 Habitat Obj. = 988,400 |
|---|---|---|---|---|
| ***Population Estimates*** (# of individuals) | | | | |
| Estimated population on all **CFAs** | 1,210 | 3,035 | 8,175 | 11,740 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 17% | 10% | 14% | 20% |
| Estimated population on all **Conserved Lands** | 2,640 | 58,295 | 65,475 | 76,740 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 38% | 194% | 109% | 128% |
| ***Acres of Habitat*** | | | | |
| Acres of potentially suitable habitat on **CFAs** | 42,310 | 19,815 | 52,300 | 83,950 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 9.8% | 4.0% | 5.7% | 8.5% |
| Acres of potentially suitable habitat on **Conserved Lands** | 96,745 | 394,035 | 438,455 | 509,535 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 22% | 80% | 44% | 52% |

**E. American woodcock**

Through the acquisition of the proposed lands within CFAs in the watershed, Conte Refuge lands would provide approximately 185,590 acres of upland forest, forested wetland, and wet shrub habitat representing potentially suitable habitat for American woodcock. With protection and appropriate management (to be specified in habitat management plans), these acres have the potential to support an estimated American woodcock population of 4,565 birds. With protection and appropriate management within the network of conserved lands in the watershed, the network could potentially support an estimated American woodcock population of 38,080 birds on 1,496,670 acres of potentially suitable habitat for this species. Breaking these bird population and habitat numbers down by BCRs and comparing them to established population and habitat objectives for BCRs 14 and 30 results in the following comparisons:

| American woodcock | BCR 14[1]<br>Pop. Obj.* = 163,090<br>Habitat Obj. = 4,006,045ac | BCR 30[1]<br>Pop. Obj.* = 46,268<br>Habitat obj. = 2,230,080ac |
|---|---|---|
| ***Population Estimates***<br>(# of individuals) | | |
| Estimated population on all **CFAs** | 3,655 | 910 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 2.2% | 2.0% |
| Estimated population on all **Conserved Lands** | 36,045 | 2,035 |
| Percent (%) of BCR population objective contributed by all **Conserved Lands** | 22% | 4.4% |
| ***Acres of Habitat*** | | |
| Acres of potentially suitable habitat on all **CFAs** | 141,720 | 43,870 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 3.5% | 2.0% |
| Acres of potentially suitable habitat on **Conserved Lands** | 1,398,520 | 98,150 |
| Percent (%) of BCR habitat objective contributed by all **Conserved Lands** | 35% | 4% |

[1] *Population objectives presented from the American Woodcock Conservation Plan (http://www.timberdoodle.org/sites/default/files/woodcockPlan_0.pdf; accessed May 2014) are expressed in terms of number of singing males to be added to the current breeding population and habitat objectives are expressed in terms of number of additional early succession acres needed to support those additional birds.*

*Assessing Contribution of Potential Management Activities to Create Successional Habitat*

Active habitat management to create successional habitat for American woodcock and other disturbance-dependent wildlife (e.g., NEC) is likely to be incorporated into the habitat management plans for various CFAs in the watershed. Three of the CFAs occur within NEC focus areas, where there are targets of maintaining 1,000 acres of early successional habitat within each NEC focus area. Conte Refuge lands would not be contributing all these acres to each NEC focus area, but for the purposes of this analysis, we assume that the refuge would plan to contribute about 25 percent of these acres, or 775 acres across the three NEC focus areas. In addition, we assume that following recent management history on the refuge, approximately 60 acres will be actively managed every 5 years within acquired forest land, for a total of 180 acres over the 15 year period of this CCP. On the acres to be actively managed for early successional habitat, we assume breeding woodcock densities to be twice the density in appropriate habitat types without active management. Under these assumptions for active habitat management for early successional habitat, a total American woodcock population of 4,610 could be supported within the CFAs, with BCR breakdowns as follows:

| American woodcock | BCR 14<br>Pop. Obj. = 163,090<br>Habitat Obj. = 4,006,045ac | BCR 30<br>Pop. Obj. = 46,268<br>Habitat obj. = 2,230,080ac |
|---|---|---|
| Estimated population on all CFAs | 3,665 | 945 |
| Percent (%) of BCR population objective contributed by all CFAs | 2.2% | 2.0% |
| Acres of potentially suitable habitat on CFAs | 141,900 | 44,645 |
| Percent (%) of BCR habitat objective contributed by all CFAs | 3.5% | 2.0% |

**F. Bobolink**

Under the draft CCP/EIS alternative C, Conte Refuge would acquire up to 8,211 acres of pasture, hay, grassland, and other lower quality agricultural lands within the watershed. As these lands are acquired, they will be assessed to determine what their best habitat contribution is and to decide if those in grassland habitat will continue to be maintained as grassland habitat.

The National Land Cover Dataset (NLCD 2006) suggests that approximately 50 percent of the pasture, hay, grassland, and agricultural lands within the Connecticut River Valley are typically maintained in grassland habitat (pasture, hay, or grassland) and about 50 percent are maintained in row crop agriculture. Based on this information, we anticipate that up to 4,105 acres of grassland habitat could be restored after the existing grassland, hay, and pasture is acquired under the draft CCP/EIS alternative C.

With protection and appropriate management (to be specified in habitat management plans) of these acres within the CFAs, Conte Refuge lands could potentially support an estimated bobolink population of 920 birds on 4,105 acres of potentially suitable grassland habitat. Breaking these bird population and habitat numbers down by BCRs and comparing them to established population and habitat objectives for BCRs 14 and 30 results in the following comparisons. We also provide estimates of bobolink populations and acres of potentially suitable habitat on the existing conserved lands network within the watershed for comparison with lands targeted by the proposed land acquisition.

| **Bobolink** | **BCR 14**[1]<br>Pop. Obj. = 1,535,965<br>Habitat Obj. = 3,795,370ac | **BCR 30**[2]<br>Pop. Obj. = 30,000<br>Habitat obj. = 74,130ac |
|---|---|---|
| ***Population Estimates***<br>(# of individuals) | | |
| Estimated population on all **CFAs** | 555 | 365 |
| Percent (%) of BCR population objective contributed by all **CFAs** | 0.03% | 1.2% |
| Estimated population on existing **Conserved Lands** | 10,020 | 170 |
| Percent (%) of BCR population objective contributed by **Conserved Lands** | 0.7% | 0.6% |
| ***Acres of Habitat*** | | |
| Acres of potentially suitable habitat in **CFAs** | 1,370 | 2,735 |
| Percent (%) of BCR habitat objective contributed by all **CFAs** | 0.03% | 3.7% |
| Acres of potentially suitable habitat on existing **Conserved Lands** | 24,765 | 1,285 |
| Percent (%) of BCR habitat objective contributed by **Conserved Lands** | 0.7% | 1.7% |

[1] *Population objective from the BCR 14 Bird Conservation Plan; habitat objective calculated based on estimated densities from published studies.*

[2] *Population objective from the PIF Landbird Conservation Plan and PIF population estimates database; habitat objective calculated based on estimated densities from published studies.*

**G. Waterfowl habitat, American black duck, and wood duck**

The ACJV has established habitat objectives within waterfowl focus areas for supporting the full suite of waterfowl occurring within the ACJV boundaries. Three of these focus areas exist within the watershed: (1) the Connecticut River and Tidal Wetlands Complex Focus Area along the lower Connecticut River in Connecticut,(2) the Connecticut River Focus Area, which runs along the Connecticut River in New Hampshire and Vermont, from the Massachusetts border to the river origin, and (3) the Lake Memphremagog Focus Area in Essex and Orleans County in northern Vermont.

American black duck is a high priority species for the NAWMP, the ACJV, BCR 14, and is the focus of the Black Duck Joint Venture. The ACJV is currently in the process of establishing breeding population objectives for this species, but they were not available yet at the time this document was written. We provide estimates of acres of potential black duck habitat within CFAs and the estimated number of breeding black duck pairs that could potentially be supported by this habitat. Comparisons with population objectives can be done when the breeding population objectives have been completed by the ACJV.

Wood duck is identified as a high priority species for the Atlantic Flyway Council and as a continentally high priority species for the NAWMP. BCR 14 is recognized by the NAWMP as a high priority region for breeding need and BCR 30 is considered a moderate priority region for breeding need for wood duck. While no regional population objectives have been established for wood duck, the regional priority rankings suggest that the watershed can make significant contributions to sustaining the Atlantic Flyway population at or above target levels for harvest management purposes.

By protecting additional freshwater wetlands and saltmarsh, contributions that the proposed land protection under draft CCP/EIS alternative C could be expected to make toward waterfowl habitat objectives within the ACJV waterfowl focus areas and toward supporting breeding populations of American black duck and wood duck are as follows:

| ACJV Waterfowl Focus Area | ACJV Waterfowl Habitat Objective (acres) | Acres of wetland habitat in CFAs within Focus Areas | Percent (%) of Waterfowl Habitat Objective contributed by CFAs |
|---|---|---|---|
| Connecticut River and Tidal Wetlands Complex – in CT | 1,157 | 1,700 | 147% |
| Connecticut River – in NH | 3,200 | 3,100 | 97% |
| Connecticut River – in VT | 250 | 1,240 | 496% |
| Lake Memphremagog –in VT | 5,101 | 3,969 | 78% |
| Total for entire Atlantic Flyway | 1,577,594 | 10,009 | 0.6% |

| State | Acres of Potential Wood Duck Breeding Habitat in all CFAs (including freshwater wetland and forested wetland) | Potential Breeding American Black Duck Population Supported within CFAs (# of breeding pairs, estimated at 0.1-0.05 pairs/ha of potential habitat, depending on suitability[1]) | Potential Breeding Wood Duck Population Supported within CFAs (# of breeding pairs, estimated at 0.25 pairs/acre of potential habitat[2]) |
|---|---|---|---|
| CT | 6,685 | 135 | 1,671 |
| MA | 2,590 | 520 | 648 |
| NH | 3,816 | 154 | 954 |
| VT | 3,378 | 137 | 845 |
| Watershed Total | 16,469 | 946 | 4,118 |

[1] *Based on estimates of breeding pair estimates from Maisonneuve, et al. 2006.* Journal of Wildlife Management. *70:450-459; and Merendinno and Ankney. 1994. Condor. 96:411-421.*

[2] *Based on estimates of cavity densities presented in Dugger and Fredrickson. 1992.* Life History and Habitat Needs of the Wood Duck *in* The Waterfowl Management Handbook. *Fish and Wildlife Leaflet 13. U.S. Fish and Wildlife Service, Washington, DC. (http://www.nwrc.usgs.gov/wdb/pub/wmh/13_1_6.pdf)*

**H. Migratory Stopover Habitat**

A study of spring stopover habitat use by neotropical migrant birds within the Connecticut River Valley (*http://www.science.smith.edu/stopoverbirds/index.html*) conducted by Smith College through funding by Conte Refuge and the Service's Northeast Region–Migratory Bird Program provides indications of the importance of the watershed to migrating birds. During a 3-year study (1996 to 1998), observers conducted 8,640 point count surveys and counted a total of 102,259 birds. The results demonstrated that spring migrant birds using the Eastern Flyway reach the southern portions of the watershed in large numbers, then disperse throughout the watershed and beyond as they continue north. Almost half (47 percent) of the birds counted within the defined count circles were at sites along the mainstem of the river. This trend was even more pronounced along the Connecticut and Massachusetts portions of the river and during the early periods of spring migration. Forested wetlands and shrub swamps are likely to be particularly valuable habitats along the mainstem of the river because they provide more food and protection earlier in the spring migratory period due to warmer air and water temperatures and earlier tree leaf-out. Overall density of birds observed decreased by about half from south to north, as birds dispersed away from the mainstem of the river as they moved north. The mouth and lower mainstem of the river may serve as a landscape feature used by many Eastern Flyway migrants to orient north after reaching the southern New England coast. The results of this study suggest that habitat protection within the watershed will have significant benefits for supporting neotropical migrants during the spring migratory period, especially forest and shrub wetlands along the mainstem of the river.

# Attachment II

## Conservation Focus Area (CFA) Parcel Tables and Corresponding Parcel Maps

The following table (CII.1) and map (CII.1) provide an example of how the approximately 5,000 individual land parcels are detailed in our proposal. Access to CFA parcel maps and tier assignments that comprise the full project is available on our Website at *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html*.

The following example of table and corresponding map present the unique map identifier for each individual parcel, the parcel's official identifier in town or county records, its size in acres, whether it is currently in public or private ownership, our priority ranking for the parcel represented in tiers, the State it is in, the Town it is in, and whether it has any existing conservation status.

As detailed in Part IV of the LPP, we plan to only acquire either a full or partial interest in a parcel when willing sellers make them available and if funding is available. Due to our willing seller only policy and longstanding practice and other landowner preferences; approximately 10 percent of the parcels or 10 percent of the land included in the LPP will likely not be acquired by the Service. The following is a list of the definitions of each column heading:

| **CFA[1] Map Number** | **Parcel[2] Label** | **Tax[3] Parcel ID** | **Acres[4]** | **Ownership Type[5]** | **Tier[6]** | **State[7]** | **Town[8]** | **Current Conservation Status, if any[9]** |
|---|---|---|---|---|---|---|---|---|

[1] **CFA Map Number:** A three letter acronym provides a unique identifier for each respective CFA.

[2] **Parcel Label:** This number corresponds to the unique parcel identifier on the corresponding CFA map.

[3] **Tax Parcel ID**: This numeric or alphanumeric code represents the official town or county tax identifier for the individual parcel

[4] **Acres**: This represents the size of the individual parcel in acres based on official tax records.

[5] **Ownership Type**: The indicates whether the current owner is a "Private" or "Public" entity

[6] **Tier**: Individual parcels are ranked as either being in Tier 1, Tier 2, or Tier 3 based on the presence and amount of important terrestrial habitat, presence and amount of important water and wetlands habitat, and its size. Tier 1 parcels include more and larger important habitat areas and are bigger in size. See Table 4 in LPP and associated narrative for more information.

[7] **State**: This indicates the respective State the parcel lies in.

[8] **Town**: This indicates the respective Town the parcel lies in.

[9] **Conservation Status**: This indicates whether the parcel has any existing conservation status based on an interest from another conservation organization. If known, fee interest or easement interest is indicated. We would not pursue acquisition of land already in an existing, permanent conservation status, except under extenuating circumstances.

**Table CII.1. Example Parcel Table for Proposed Blueberry Swamp Conservation Focus Area (CFA) (full project can be accessed at:** *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html )*

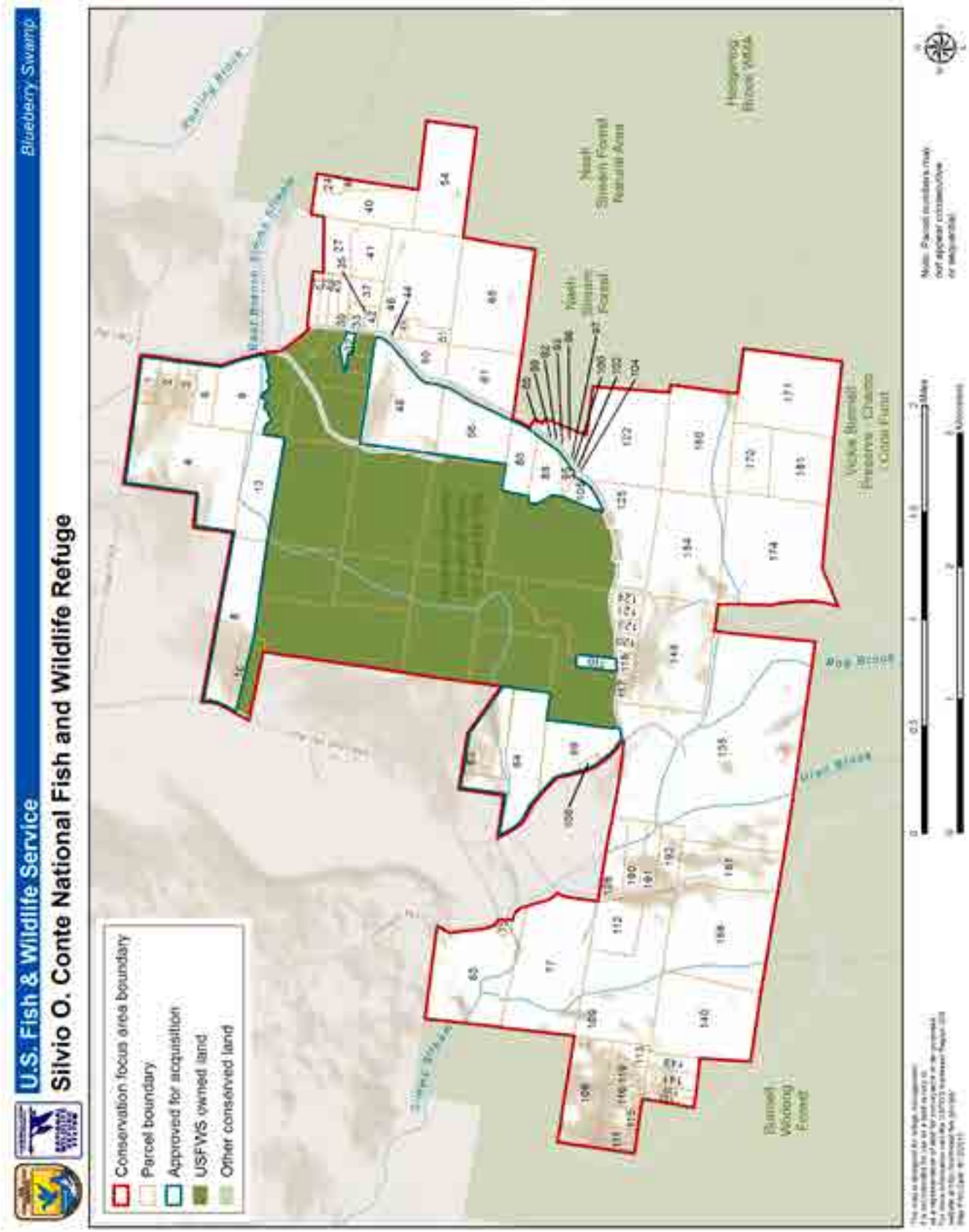
| **CFA[1] Map Number** | **Parcel[2] Label** | **Tax[3] Parcel ID** | **Acres[4]** | **Ownership Type[5]** | **Tier[6]** | **State[7]** | **Town[8]** | **Existing Conservation Status (if any)[9]** |
|---|---|---|---|---|---|---|---|---|
| BBS1 | 1 | 420-17 | 14.0 | Private | 2 | NH | Columbia | |
| BBS1 | 2 | 420-16 | 12.4 | Private | 3 | NH | Columbia | |
| BBS1 | 3 | 420-15 | 12.2 | Private | 3 | NH | Columbia | |
| BBS1 | 4 | 420-18 | 143.9 | Private | 2 | NH | Columbia | |
| BBS1 | 6 | 420-14 | 17.8 | Private | 3 | NH | Columbia | |

| CFA[1] Map Number | Parcel[2] Label | Tax[3] Parcel ID | Acres[4] | Ownership Type[5] | Tier[6] | State[7] | Town[8] | Existing Conservation Status (if any)[9] |
|---|---|---|---|---|---|---|---|---|
| BBS1 | 8 | 417-100.2 | 78.5 | Private | 2 | NH | Columbia | |
| BBS1 | 9 | 420-13 | 51.9 | Private | 2 | NH | Columbia | |
| BBS1 | 10 | 417-101 | 11.5 | Private | 3 | NH | Columbia | |
| BBS1 | 12 | - | 15.2 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 13 | 420-8 | 52.9 | Private | 2 | NH | Columbia | |
| BBS1 | 15 | - | 110.9 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 17 | - | 56.7 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 18 | - | 61.0 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 19 | - | 23.6 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 20 | - | 5.5 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 21 | 420-60 | 7.8 | Private | 3 | NH | Columbia | |
| BBS1 | 23 | 420-61 | 7.0 | Private | 3 | NH | Columbia | |
| BBS1 | 24 | 420-44 | 6.7 | Private | 3 | NH | Columbia | |
| BBS1 | 25 | - | 5.1 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 26 | 420-62 | 7.3 | Private | 3 | NH | Columbia | |
| BBS1 | 27 | 420-49 | 22.5 | Private | 3 | NH | Columbia | |
| BBS1 | 28 | - | 114.3 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 29 | - | 34.2 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 30 | 420-63 | 7.2 | Private | 3 | NH | Columbia | |
| BBS1 | 31 | - | 119.3 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 32 | 420-3.2 | 4.6 | Private | 3 | NH | Columbia | |
| BBS1 | 33 | 420-65 | 5.3 | Private | 3 | NH | Columbia | |
| BBS1 | 34 | - | 6.7 | Federal | 3 | NH | Columbia | |
| BBS1 | 35 | 420-66 | 0.8 | Private | 3 | NH | Columbia | |
| BBS1 | 36 | 420-45 | 5.4 | Private | 3 | NH | Columbia | |
| BBS1 | 37 | 420-64 | 12.9 | Private | 3 | NH | Columbia | |
| BBS1 | 38 | - | 5.5 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 39 | - | 52.2 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 40 | 420-46 | 46.5 | Private | 2 | NH | Columbia | |
| BBS1 | 41 | 420-48 | 27.9 | Private | 3 | NH | Columbia | |
| BBS1 | 42 | 420-67 | 4.8 | Private | 3 | NH | Columbia | |
| BBS1 | 44 | 421-11 | 0.1 | Private | 3 | NH | Columbia | |
| BBS1 | 46 | 421-12 | 97.1 | Private | 1 | NH | Columbia | |
| BBS1 | 48 | 421-10 | 95.9 | Private | 2 | NH | Columbia | |
| BBS1 | 49 | 421-14 | 3.0 | Private | 3 | NH | Columbia | |
| BBS1 | 50 | 421-15 | 20.4 | Private | 2 | NH | Columbia | |

| CFA[1] Map Number | Parcel[2] Label | Tax[3] Parcel ID | Acres[4] | Ownership Type[5] | Tier[6] | State[7] | Town[8] | Existing Conservation Status (if any)[9] |
|---|---|---|---|---|---|---|---|---|
| BBS1 | 51 | 421-16 | 10.0 | Private | 3 | NH | Columbia | |
| BBS1 | 53 | - | 104.5 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 54 | 421-13 | 77.4 | Private | 1 | NH | Columbia | |
| BBS1 | 56 | 421-8 | 61.2 | Private | 2 | NH | Columbia | |
| BBS1 | 58 | - | 106.2 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 60 | 416-18 | 107.8 | Private | 2 | NH | Columbia | |
| BBS1 | 61 | 421-17 | 51.6 | Private | 2 | NH | Columbia | |
| BBS1 | 63 | 416-34 | 43.4 | Private | 2 | NH | Columbia | |
| BBS1 | 64 | 416-53 | 76.9 | Private | 2 | NH | Columbia | |
| BBS1 | 65 | 421-18 | 109.2 | Private | 1 | NH | Columbia | |
| BBS1 | 69 | - | 63.0 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 71 | - | 102.7 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 72 | - | 137.3 | Federal | 2 | NH | Columbia | |
| BBS1 | 75 | 416-17 | 3.1 | Private | 3 | NH | Columbia | |
| BBS1 | 77 | 416-6 | 134.0 | Private | 3 | NH | Columbia | |
| BBS1 | 80 | 421-7 | 26.0 | Private | 3 | NH | Columbia | |
| BBS1 | 85 | 421-20.1 | 1.0 | Private | 3 | NH | Columbia | |
| BBS1 | 88 | 421-6 | 23.3 | Private | 3 | NH | Columbia | |
| BBS1 | 89 | 421-21 | 0.3 | Private | 3 | NH | Columbia | |
| BBS1 | 92 | 421-22 | 2.2 | Private | 3 | NH | Columbia | |
| BBS1 | 93 | 421-24 | 1.0 | Private | 3 | NH | Columbia | |
| BBS1 | 95 | 421-5 | 5.1 | Private | 3 | NH | Columbia | |
| BBS1 | 96 | 421-28 | 11.7 | Private | 3 | NH | Columbia | |
| BBS1 | 97 | 421-25 | 0.3 | Private | 3 | NH | Columbia | |
| BBS1 | 99 | 416-55.2 | 47.0 | Private | 3 | NH | Columbia | |
| BBS1 | 100 | 421-26 | 0.2 | Private | 3 | NH | Columbia | |
| BBS1 | 101 | - | 67.1 | Federal | Conserved | NH | Columbia | Fee |
| BBS1 | 102 | 421-28.1 | 0.2 | Private | 3 | NH | Columbia | |
| BBS1 | 104 | 421-27 | 0.2 | Private | 3 | NH | Columbia | |
| BBS1 | 105 | 421-3 | 10.9 | Private | 3 | NH | Columbia | |
| BBS1 | 106 | 416-5 | 56.4 | Private | 3 | NH | Columbia | |
| BBS1 | 107 | 416-4 | 2.0 | Private | 3 | NH | Columbia | |
| BBS1 | 108 | 416-55.1 | 2.7 | Private | 3 | NH | Columbia | |
| BBS1 | 109 | 416-46 | 119.6 | Private | 3 | NH | Columbia | |
| BBS1 | 110 | 416-56.1 | 6.8 | Private | 3 | NH | Columbia | |
| BBS1 | 111 | 411-2 | 12.4 | Private | 3 | NH | Columbia | |

| CFA[1] Map Number | Parcel[2] Label | Tax[3] Parcel ID | Acres[4] | Ownership Type[5] | Tier[6] | State[7] | Town[8] | Existing Conservation Status (if any)[9] |
|---|---|---|---|---|---|---|---|---|
| BBS1 | 112 | 416-47 | 34.1 | Private | 3 | NH | Columbia | |
| BBS1 | 113 | 416-3 | 11.1 | Private | 3 | NH | Columbia | |
| BBS1 | 115 | 411-3 | 11.3 | Private | 3 | NH | Columbia | |
| BBS1 | 116 | 416-1 | 11.5 | Private | 3 | NH | Columbia | |
| BBS1 | 117 | 416-61 | 5.9 | Private | 3 | NH | Columbia | |
| BBS1 | 118 | 416-60 | 5.6 | Private | 3 | NH | Columbia | |
| BBS1 | 119 | 416-2 | 11.4 | Private | 3 | NH | Columbia | |
| BBS1 | 120 | 416-59 | 5.7 | Private | 3 | NH | Columbia | |
| BBS1 | 121 | 421-34 | 6.4 | Private | 3 | NH | Columbia | |
| BBS1 | 122 | 421-29 | 104.7 | Private | 3 | NH | Columbia | |
| BBS1 | 123 | 416-58 | 5.2 | Private | 3 | NH | Columbia | |
| BBS1 | 124 | 421-32 | 5.1 | Private | 3 | NH | Columbia | |
| BBS1 | 125 | 421-30 | 62.8 | Private | 2 | NH | Columbia | |
| BBS1 | 126 | 416-43.1 | 22.3 | Private | 2 | NH | Columbia | |
| BBS1 | 133 | 416-52 | 5.9 | Private | 3 | NH | Columbia | |
| BBS1 | 135 | 416-62.1 | 422.3 | Private | 2 | NH | Columbia | |
| BBS1 | 139 | 416-51 | 6.0 | Private | 3 | NH | Columbia | |
| BBS1 | 140 | 416-48 | 108.8 | Private | 3 | NH | Columbia | |
| BBS1 | 141 | 416-50 | 11.8 | Private | 3 | NH | Columbia | |
| BBS1 | 143 | 416-49 | 11.2 | Private | 3 | NH | Columbia | |
| BBS1 | 149 | 421-33 | 114.0 | Private | 3 | NH | Columbia | |
| BBS1 | 154 | 421-31 | 104.6 | Private | 2 | NH | Columbia | |
| BBS1 | 160 | 421-31.01 | 97.5 | Private | 2 | NH | Columbia | |
| BBS1 | 161 | 416-44 | 60.7 | Private | 3 | NH | Columbia | |
| BBS1 | 166 | 416-45 | 132.5 | Private | 2 | NH | Columbia | |
| BBS1 | 170 | 422-2.2 | 38.3 | Private | 3 | NH | Columbia | |
| BBS1 | 171 | 422-3 | 105.5 | Private | 3 | NH | Columbia | |
| BBS1 | 174 | 422-1 | 153.2 | Private | 1 | NH | Columbia | |
| BBS1 | 181 | 422-2.1 | 58.2 | Private | 2 | NH | Columbia | |
| BBS1 | 190 | 416-43.2 | 18.9 | | 2 | NH | Columbia | |
| BBS1 | 191 | 416-43.3 | 14.8 | | 2 | NH | Columbia | |
| BBS1 | 192 | 416-43.4 | 19.8 | | 2 | NH | Columbia | |

*Map CII.1. Example Parcel Map for Proposed Blueberry Swamp Conservation Focus Area (CFA)* (full project can be accessed at: *http://www.fws.gov/refuge/Silvio_O_Conte/what_we_do/conservation.html*



# Attachment III

## Connecticut River Watershed Landscape Conservation Design
## Overview and Example of Three Data Products

### Overview

The Connecticut River Watershed LCD is intended to guide and focus conservation actions, including land protection, management, restoration, and general land stewardship where it will likely do the most good towards conserving biodiversity within the Connecticut River watershed (watershed). The Connecticut River Watershed LCD provides a watershed-based conservation design to complement or supplement conservation planning done at local or finer extents. Although the Connecticut River Watershed LCD offers a way to strategically focus limited conservation resources, by itself it is not sufficient as a total solution to biodiversity conservation in the watershed. This design serves as a starting point that should be used in combination with other sources of information and tools to inform conservation decisions where a sense of role and place within a larger landscape is desirable.

The Connecticut River LCD is not a single product or map. Rather, it is a package of data products that collectively identify terrestrial core areas and connectors, aquatic core areas and their key watershed-based buffers, and restoration opportunities for dam removal, culvert upgrades, and terrestrial wildlife road passage structures. In addition to the terrestrial core-connector network product and the aquatic core-buffer network, there are 17 terrestrial data layers and 13 aquatic data layers that are considered primary products separately providing information on the ecological value of all lands and waters regardless of their inclusion in the core area network. A more comprehensive set of data products derived for the entire region are available via the University of Massachusetts Designing Sustainable Landscape project website being developed to describe in detail how these data layers were created (*http://www.umass.edu/landeco/research/dsl/products/dsl_products.html*; accessed April 2015).

The products were developed to test procedures for a landscape conservation design process that could be extended to the entire Northeast Region. These products are currently undergoing a review by the Connecticut River Watershed LCD core team member organizations.

We profile three primary Connecticut River Watershed LCD data products below and share an example map of how each data layer overlaps with three northern CFAs.

### Terrestrial core-connector network (map CIII.1)

One of the most important products from this project is the terrestrial network of core areas and the connectors between them (core-connector network). In combination with the aquatic core areas, they spatially represent the ecological network derived from the Connecticut River Watershed LCD project. The core-connector network represents a synthesis of ecological information and is designed to provide strategic guidance for conserving natural areas, and the fish, wildlife, and other components of biodiversity that they support within the watershed.

All of the other data layers either: (1) provide additional detailed information on why particular areas were included as core areas, (2) provide useful overlays to enhance the interpretation of the core-connector network (e.g., to help prioritize areas within the network), or (3) complement the core-connector network by providing seamless and continuous ecological valuation of the landscape independent of the core-connector network (e.g., to identify places with ecological value outside of the designated network).

Core areas serve as the foundation of the conservation design. They reflect decisions by the Connecticut River Watershed LCD planning team about the highest priority areas for sustaining the long term ecological values of the watershed, based on currently available, regional-scale information. Terrestrial core areas represent the following:

(1) Areas of relatively high ecological integrity across all terrestrial and wetland ecosystem types, emphasizing areas that are relatively intact (i.e., free from human modifications and disturbance) and resilient to environmental changes (e.g., climate change). Integrity has the potential to remain high, both in the short-term due to connectivity to similar natural environments, and in the long-term due to proximity to diverse landforms and other geophysical settings.

(2) Areas of relatively high current habitat value (landscape capability) for a suite of 14 representative terrestrial wildlife species, emphasizing areas that provide the best habitat and climate conditions today.

(3) Areas of high potential for floodplain forest restoration along major rivers, emphasizing areas where geomorphic characteristics favor the development of floodplain forest.

(4) Areas of rare terrestrial natural communities that support unique biodiversity, regardless of their landscape context; inclusive of communities listed by State heritage programs as S1 (extremely rare), S2 (rare), and S3 (uncommon), with definitions of S1 to S3 varying slightly among states.

Core areas are built from focal areas with high value based on one or more of the attributes listed above. These "seed areas" are expanded to encompass surrounding areas that provide additional ecological value and resilience to both short- and long-term change. These surrounding areas within the core areas are typically of high to moderate ecological value. To maintain a coherent shape and size, in some cases core areas contain low-intensity development and minor roads, but high-intensity development and major roads are excluded. Collectively, terrestrial core areas encompass 25 percent of the watershed area, as decided by the partnership. A total of 1,202 core areas have been identified, ranging in size from approximately 20 acres to 65,500 acres, with an average size of 1,500 acres.

Connectors represent "corridors" that could facilitate the movement of plants and animals (i.e., ecological flow) between terrestrial core areas. These connectors increase the resiliency of the core area network to uncertain changing land use and climate. They are wider where more movement between cores is expected because of larger and closer core areas and a more favorable natural environment between them. Connectors primarily link adjoining core areas where there is the greatest similarity in ecosystems; they do not necessarily represent travel corridors for any individual species. Connectors may traverse through areas of low-density development and cross roads of all classes, but they do not include high-intensity development. Connectors are not identified between core areas that are greater than 10 kilometer apart. Collectively, connectors encompass an additional 22 percent of the Connecticut River watershed area.

The core area network can serve as a starting point for a regional conservation network that can be used in combination with other sources of information to direct action. Although the terrestrial core areas and connectors are presented as discrete entities, it is important to recognize that their boundaries are, in fact, "fuzzy" and are best interpreted as general places to focus attention. In addition, terrestrial core areas and connectors are not the only places of high ecological value deserving of conservation attention in the watershed.

While 25 percent of the watershed is located in areas identified as core areas, about 50 percent of the existing conserved land (1.8 million acres +/-) is located in these core areas. The Connecticut River Watershed LCD Team established a target of investing 25 percent of the watershed in strategic core areas. Therefore, a 900,000-acre increase in conservation efforts toward core areas may be deemed desirable by agency, community, and individual decision makers. Further, about 22 percent of the watershed was identified as connector habitat. Under these parameters, the refuges CFAs have a 77 percent overlap with these priority core and connector areas. When climate chage was integrated into the formula, creating a more stringent and smaller percentage of the watershed, the CFA overlap actually increased to 79 percent. In essence, and under either scenario, the refuge contribution toward the larger landscape core and connector target could total approximately 150,000 of existing and proposed core and connector habitat.

### Terrestrial ecological integrity selection index (map CIII.2)

This layer provides a seamless and continuous valuation of ecological integrity and biodiversity value based on regionally available and consistent spatial data, and based on decisions by the Connecticut River Watershed LCD planning team. This product is a primary input used to create terrestrial ecosystem based core areas. The selection index is a continuous surface in which every cell is assigned a value (0-1) based on its relative ecological integrity and/or biodiversity value within each USGS HUC6 watershed. Higher values represent better ecological or biodiversity conditions. Terrestrial core areas are created, in part, by choosing cells above a certain index value and spreading outwards from these seeds to build larger, buffered cores of relatively high ecological value.

Specifically, for all terrestrial and wetland cells, the selection index is a composite index derived from a weighted combination of the (1) weighted index of ecological integrity (IEI), (2) TNC's terrestrial resiliency index, and a binary representation of (3) TNC's tier 1 floodplains and (4) S1-S3 rare natural communities as defined and mapped by the state Natural Heritage programs. For aquatic cells (which are also included in this layer), the index is equal to IEI, except in headwater creeks where IEI is averaged with USGS's stream temperature tolerance index.

Importantly, this layer provides an ecological valuation of areas both inside and outside designated core areas, and thus it can be used to identify places of high ecological value outside of designated core areas that are also deserving of conservation attention.

### Species landscape capability (map CIII.3)

This product provides a seamless and continuous valuation of landscape capability for each of the 14 representative terrestrial wildlife species modeled in the Connecticut River Watershed LCD project. This product is another primary input used to create terrestrial ecosystem based core areas. The 14 modeled species are:

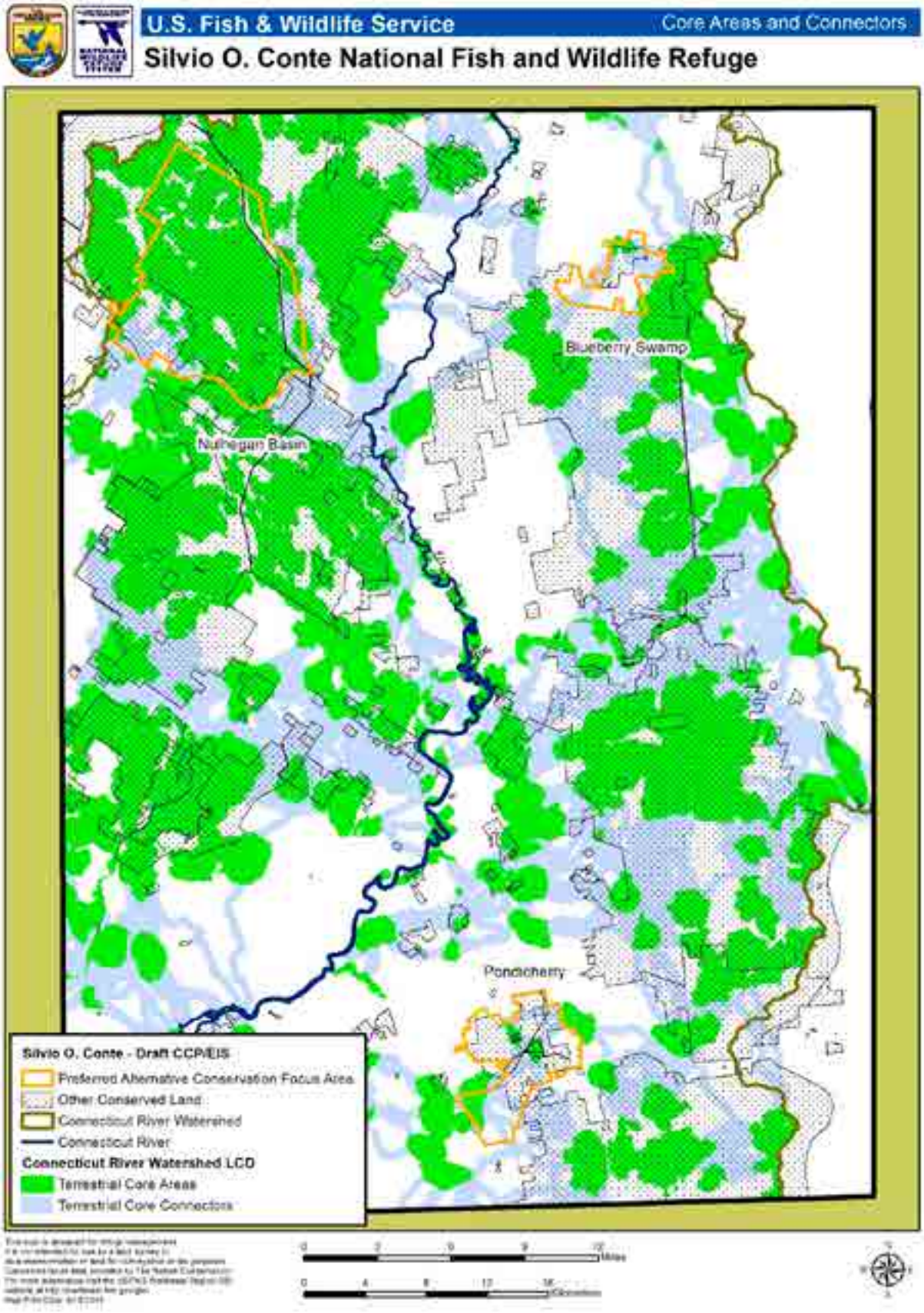
(1) American woodcock
(2) Black bear
(3) Blackburnian warbler
(4) Blackpoll warbler
(5) Eastern meadowlark
(6) Louisiana waterthrush
(7) Marsh wren
(8) Moose
(9) Northern waterthrush
(10) Prairie warbler
(11) Ruffed grouse
(12) Wood duck
(13) Wood thrush
(14) Wood turtle

Landscape capability is an integrated measure of habitat capability, climate suitability and species' prevalence, and is based on a unique model developed for each species. There are several different landscape capability indices that reflect different decisions (or assumptions) regarding how to incorporate current versus future land use and climate changes. The example provided here is based on the current landscape capability index for blackburnian warbler.

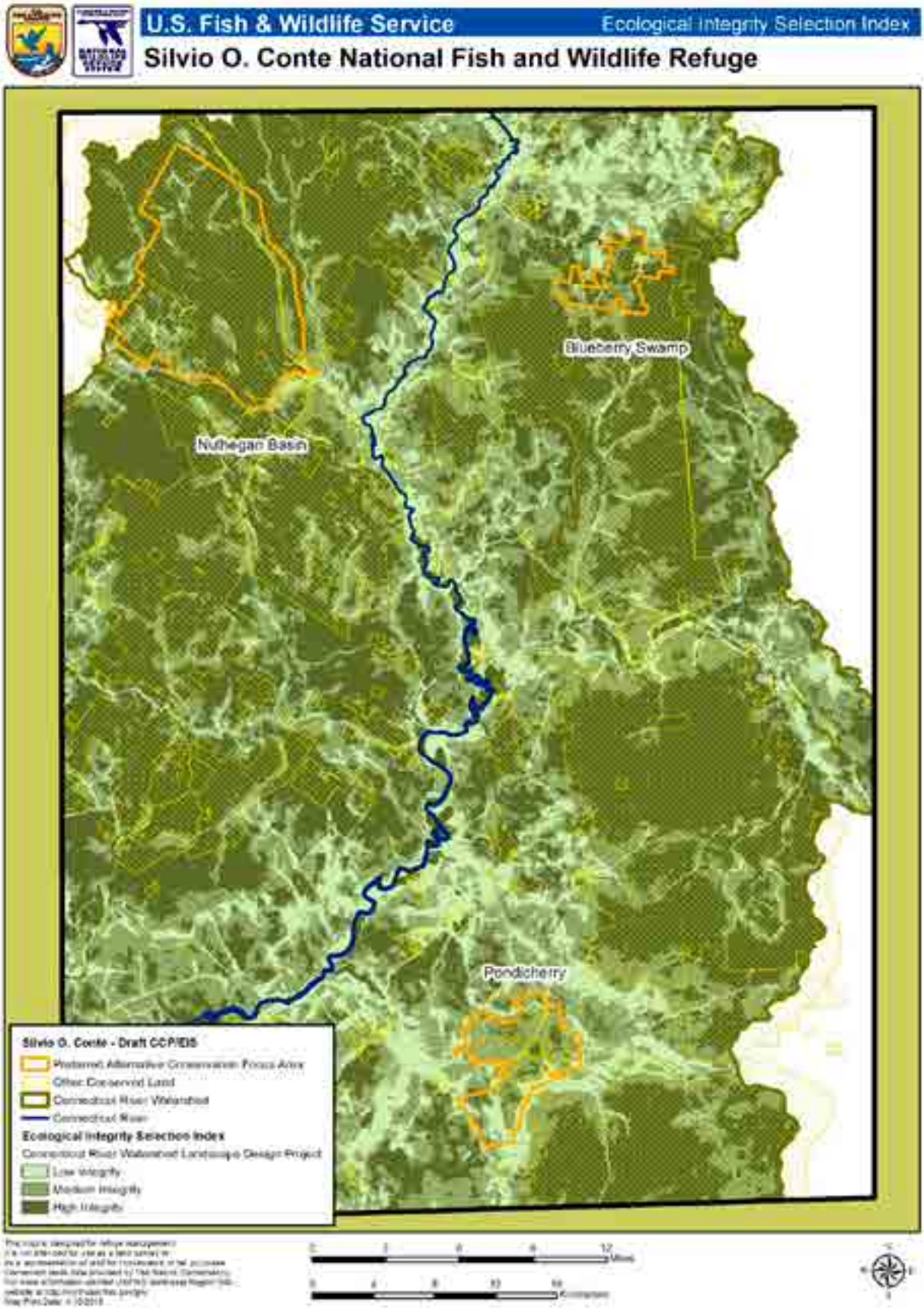
The landscape capability maps for each species provide an ecological valuation of areas, both inside and outside designated core areas, and thus they can be used to identify places of high ecological value for one or more representative species, outside of designated core areas, that are also deserving of conservation attention.

Since species were modeled individually, the landscape capability index is not comparable across species. It can only be used separately for each species to evaluate the relative capability of one location against another to support that species. The index is also not an estimate of occupancy. It does not give the probability that a cell will be occupied by the species. Rather, it is an index of the relative capability of a site to support reproduction and survival of the focal species in a home range centered on that cell.

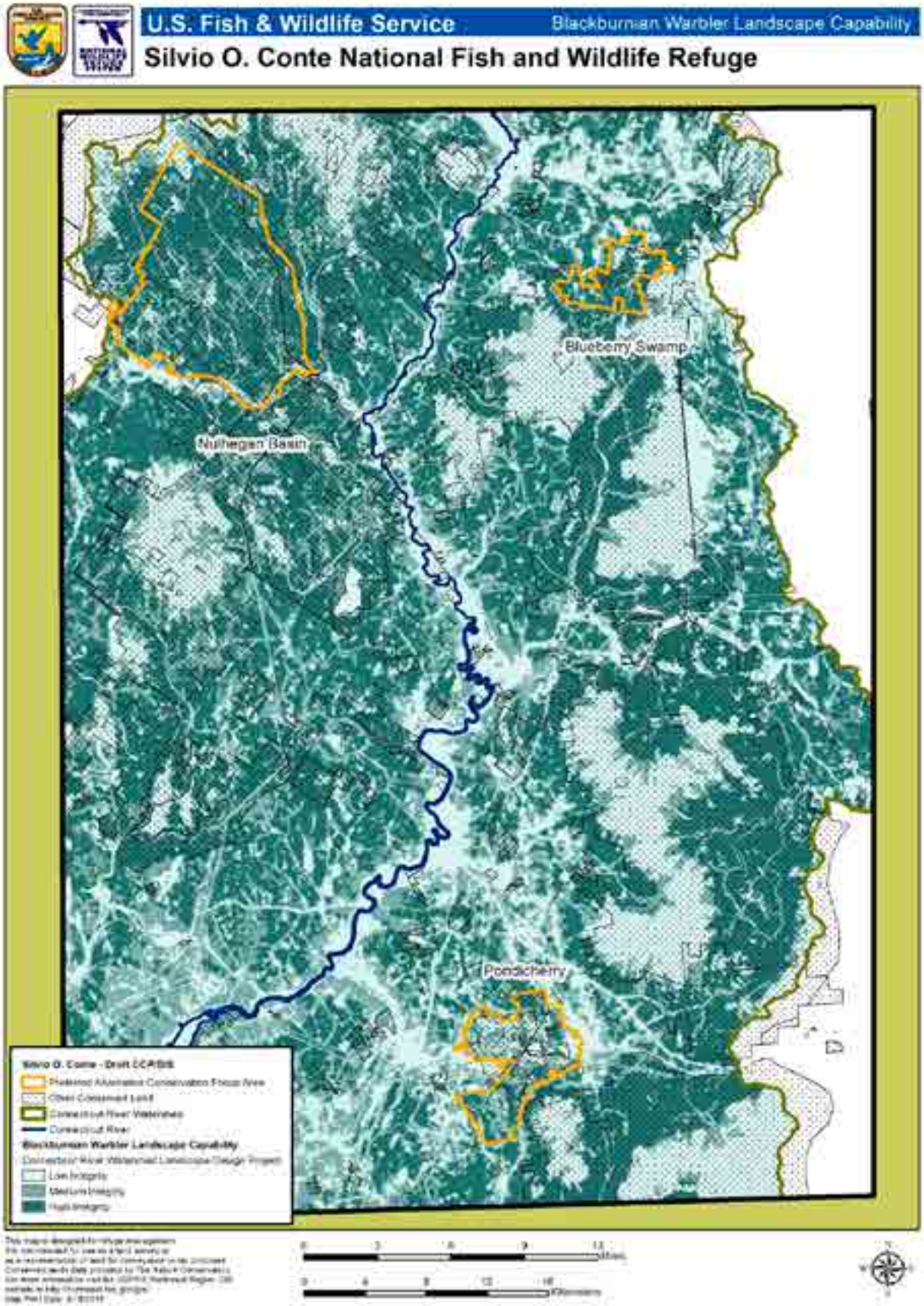
*Map CIII.1. Example of How the Blueberry Swamp, Nulhegan Basin, and Pondicherry CFAs Overlap with the Connecticut River Watershed LCD Project's Terrestrial Core-connector Network Product.*



*Map CIII.2. Example of How the Blueberry Swamp, Nulhegan Basin, and Pondicherry CFAs Overlap with the Connecticut River Watershed LCD Project's Ecological Integrity Selection Index Product.*



*Map CIII.3. Example of How the Blueberry Swamp, Nulhegan Basin, and Pondicherry CFAs Overlap with the Connecticut River Watershed LCD Project's Blackburnian Warbler Landscape Capability Index Product.*



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Appendix D

USFWS

*Mowing a woodcock roosting area on the Nulhegan Basin Division*

# Findings of Appropriateness and Compatibility Determinations

## Findings of Appropriateness and Compatibility Determinations

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**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** All-terrain Vehicles and Other Off-road Vehicles

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | | ✔ |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | | ✔ |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | | ✔ |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | | ✔ |
| (g) Is the use manageable within available budget and staff? | | ✔ |
| (h) Will this be manageable in the future within existing resources? | | ✔ |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✔ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | | ✔ |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ✔.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** ✔ **Appropriate** _____

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** All-terrain Vehicles and Other Off-road Vehicles[1]

## NARRATIVE:

As part of the Comprehensive Conservation Plan (CCP) planning process for Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge, refuge), refuge staff have evaluated all existing or requested non-priority public uses to determine if they are an appropriate use for the refuge. The use of all-terrain vehicles (ATVs) and other off-road vehicles, such as dirt bikes, is a not a priority public use of the National Wildlife Refuge System (Refuge System), as defined under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The use of ATVs and other off-road vehicles on the refuge does not contribute to any priority public uses. This finding of appropriateness also covers the off-road use of bicycles, cars, and motorcycles. Although these vehicles are allowed on designated refuge roads, they are not allowed off of these roads.

Based on our evaluation, we have found the use of ATVs and other off-road vehicles is not appropriate at Conte Refuge for the reasons listed below.

- ATVs are specifically prohibited by Federal regulations at the refuge's Pondicherry Division (50 CFR §32.48) and Nulhegan Basin Division (50 CFR §32.65).

- ATV use on the refuge is not consistent with Executive Order 11989, which requires the Service to close areas to ATVs when we determine the use causes or will cause considerable adverse impacts on soils, vegetation, wildlife, habitats, or cultural and historic resources.

- ATV and other off-road vehicle use has the potential to disturb migratory birds, other wildlife species, and refuge visitors because they are capable of traveling at high speeds, can damage refuge habitats, and can be used throughout much of the year. ATVs and other off-road vehicles can cause considerable soil compaction and erosion and negatively impact habitats' natural hydrology by creating ruts in roads and trails, particularly during wet and muddy conditions, leading to soil erosion and siltation in refuge streams and wetlands. These types of vehicles can also damage refuge habitats and native plant communities by crushing and killing vegetation. Disturbance to wildlife and damage to soils and vegetation from ATVs and other off-road vehicles can be widespread because they are designed to, and generally are, used off roads and trails. Although snowmobiles are similar to ATVs and other off-road vehicles, the impacts of ATVs and other off-road vehicles on soils, vegetation, and wildlife are generally higher. This is because ATVs and other off-road vehicles can be used throughout much of the year, whereas snowmobiles are only used during the winter when soils are covered with snow and frozen and outside the growing and breeding season for most plants and wildlife. Also, on the Conte Refuge, snowmobiles are confined to designated, groomed trails—the majority of these trails follow the existing road network.

- Given the potential to severely damage soils and vegetation, disturb wildlife, and cause conflicts between user groups, ATVs and other off-road vehicles are not consistent with the refuge's goals to protect wildlife, promote environmental education, and support priority public uses, as defined in the Conte Refuge draft CCP/environmental impact statement. Nor is the use consistent with the refuge's purposes. The refuge's purposes are:

[1] This finding of appropriateness does not cover the use snowmobiles; please see the separate finding of appropriateness and compatibility determinations for snowmobiling at the refuge's Nulhegan Basin, Pondicherry, and Dead Branch Divisions. Snowmobiling is only allowed on designated snowmobile trails on these divisions.

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.

- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species, and the ecosystem upon which these species depend within the refuge.

- To protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 as amended (16 U.S. 1531 et seq.).

- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.

- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.

- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

- The use of ATVs and other off-road vehicles can conflict with other existing wildlife-dependent recreational uses. These vehicles may disturb wildlife and cause animals to flush, thus affecting visitors engaged in priority public uses, such as wildlife observation, photography, and fishing. ATVs and other off-road vehicles also have the potential to cause damage to refuge habitats and decrease the quality of other visitors' experiences and their ability to engage in wildlife-dependent priority public uses. These issues are greatest when ATVs and other users occupy the same areas (e.g., share trails).

**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Landing and Launching of Ultralights and Other Aircraft

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | | ✔ |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | | ✔ |
| (d) Is the use consistent with public safety? | | ✔ |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | | ✔ |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | | ✔ |
| (g) Is the use manageable within available budget and staff? | | ✔ |
| (h) Will this be manageable in the future within existing resources? | | ✔ |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✔ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | | ✔ |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ___✔___.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** ___✔___ **Appropriate** _____

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Landing and Launching of Ultralights and Other Aircraft

## NARRATIVE:

As part of the Comprehensive Conservation Plan (CCP) process for Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge, the refuge), refuge staff have evaluated all existing or requested non-priority public uses to determine if they are an appropriate use for the refuge. The landing and launching of ultralights and other types of aircraft (e.g., hang-gliders, parachutes, helicopters, hot air balloons, paragliders, and airplanes) on the refuge is not a priority public uses of the National Wildlife Refuge System (Refuge System), as defined under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

Based on our evaluation, we have found the landing and launching of ultralights and other aircraft not appropriate at Conte Refuge for several reasons:

- The landing and launching of aircraft is not consistent with Federal regulations. According to 50 CFR §27.34, "The unauthorized operation of aircraft, including sail planes, and hang gliders, at altitudes resulting in harassment of wildlife, or the unauthorized landing or take-off on a national wildlife refuge, except in an emergency, is prohibited. National wildlife refuge boundaries are designated on up-to-date FAA [Federal Aviation Administration] aeronautical charts."

- The refuge goals, as defined in the Conte Refuge draft CCP, are focused on protecting the refuge's and Connecticut River's natural resources and offering priority, wildlife-dependent recreation. The refuge's purposes are:

  - To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants fish and wildlife.

  - To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species, and the ecosystem upon which these species depend within the refuge.

  - To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 as amended (16 U.S. 1531 et seq.).

  - To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.

  - To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.

  - To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

The use is not consistent with these goals and purposes because these aircraft have the potential to disturb migratory birds and other native wildlife. In particular, these uses could disturb birds and other species that rely on grasslands because these uses are most likely to occur in grassland habitats. Wildlife may be disturbed by noise from these aircraft, particularly from low-flying crafts and those that are landing or launching. This may cause birds and other wildlife to flush or disturb nesting birds and their nests. The launching and landing of these crafts can damage vegetation and directly impact wildlife by crushing nests or individuals.

- The use does not support and is not necessary to participate in any priority public uses. These uses do not contribute to visitors' appreciation or understanding of the refuge's resources.

- These uses can conflict with other existing wildlife-dependent recreational uses by disturbing other visitors engaged in priority public uses. For example, these crafts may flush birds that photographers or hikers are observing and loud noise from engines may detract from other visitors' enjoyment of the refuge. This use also may not be consistent with public safety because refuge visitors would not expect aircraft to attempt to land on the refuge and we can not guarantee pilots a safe place to land.

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**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Model Airplane and Kite Flying

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | | ✔ |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | | ✔ |
| (g) Is the use manageable within available budget and staff? | | ✔ |
| (h) Will this be manageable in the future within existing resources? | | ✔ |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✔ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | | ✔ |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ___✔___.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** ___✔___ **Appropriate** _____

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Model airplane and kite flying

## NARRATIVE:

As part of the Comprehensive Conservation Plan (CCP) process for Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge, the refuge), refuge staff have evaluated all existing or requested non-priority public uses to determine if they are an appropriate use for the refuge. Model airplane and kite flying are not a priority public uses of the National Wildlife Refuge System (Refuge System), as defined under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). Also, these uses do not contribute to any priority public use.Based on our evaluation, we have found the use of ATVs and other off-road vehicles is not appropriate at Conte Refuge for the reasons listed below.

Based on our evaluation, we have found the use of model airplanes and kites not appropriate at Conte Refuge for several reasons:

- The refuge goals, as defined in the Conte Refuge draft CCP, are focused on protecting the refuge's and Connecticut River's natural resources and offering priority, wildlife-dependent recreation. The refuge's purposes are:

  - To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants fish and wildlife.

  - To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species, and the ecosystem upon which these species depend within the refuge.

  - To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 as amended (16 U.S. 1531 et seq.).

  - To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.

  - To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.

  - To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

  The use of model airplanes and kites is not consistent with these goals and purposes because these vehicles have the potential to disturb migratory birds and other native wildlife. In particular, these uses could disturb birds and other species that rely on grasslands because these uses are most likely to occur in grassland habitats. Wildlife may be disturbed by noise from model airplanes, particularly from low-flying planes. Additionally, model airplane users and kite flyers may need to leave trails and/or enter fields to retrieve their planes or kites. This type of off-trail use may cause birds and other wildlife to flush or disturb nesting birds and their nests.

- The use of model airplanes and kites does not support and is not necessary to participate in any priority public uses. These uses do not contribute to visitors' appreciation or understanding of the refuge's resources.

- These uses can conflict with other existing wildlife-dependent recreational uses by disturbing other visitors engaged in priority public uses. For example, kites and airplanes may flush birds that photographers or hikers are observing and loud noise from model airplane engines may detract from other visitors' enjoyment of the refuge.

**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Target Shooting

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | | ✔ |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | | ✔ |
| (d) Is the use consistent with public safety? | | ✔ |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | | ✔ |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | | ✔ |
| (h) Will this be manageable in the future within existing resources? | | ✔ |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✔ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | | ✔ |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___✔___ No _____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** ___✔___ **Appropriate** _____

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Target Shooting

## NARRATIVE:

Prior to U.S. Fish and Wildlife Service acquisition of the Nulhegan Basin Division (division) in 1999, target shooting, involving multiple types of firearms (e.g., rifles, shotguns, pistols) occurred at the division's numerous borrow pits, as well as areas adjacent to recreational cabins, and occasionally at other locations across the ownership. Likewise, this use also occurred in a similar form on the surrounding industrial timber lands. While the use has been administratively prohibited on the division since at least 2006, the use, while not actively promoted by the landowner, continues at the neighboring West Mountain Wildlife Management Area (WMA) and Plum Creek timber lands. This use was practiced primarily by the area's cabin leaseholders, and an organization representing them–the Champion Lands Leaseholders and Traditional Interests Association-has requested a reinstatement of this use to include both formal (i.e., a developed shooting range) and informal (i.e., borrow pits, cabin sites, etc.) locations. In addition to constituting a recreational activity, this use is sometimes described as a way to improve an important hunting skill and sometimes to simply ensure that a rifle remains "well-sighted" after a jostling drive over miles of gravel roads.

Formal shooting opportunities do not exist in the vicinity of the division, and as a means to address this, the Vermont Fish and Wildlife Department has proposed establishing a shooting range at the neighboring Wenlock WMA. This project was proposed several years ago, but little progress has occurred.

Target shooting poses numerous environmental, safety, and disturbance considerations–both to wildlife and refuge staff and visitors. Environmental issues relate primarily to the accumulation of lead, particularly in the backstop area (Cao et al. 2003). The myriad considerations necessary for range development is explained in National Shooting Sports Foundation (1997). In particular, they describe the two relevant Federal environmental statutes: Comprehensive Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act. Both statutes place great responsibility on the site manager for addressing contaminant issues. Noise is also an issue, both to wildlife and people. Although many variables influence the distance that sound travels, it is likely that the sound emanating from a range will cause abandonment and disuse of an area by wildlife occurring within some radius of the activity. This can be especially damaging if shooting were to occur at several sites during the breeding season. Although the potential level of this use is unknown, it is expected to be highest on weekends, which are the highest public use period. Given that the sound of firearms can travel for miles, it is likely that the noise will constitute a nuisance to other refuge visitors. If shooting was to occur outside of designated hunting seasons, such sounds can also hinder our wildlife officer's ability to distinguish target shooting from the potential illegal use of firearms.

Hunting, fishing, wildlife observation and photography, and environmental education and interpretation are the six priority public uses of the National Wildlife Refuge System. The National Wildlife Refuge System Improvement Act of 1997 instructs refuge managers to seek ways to accommodate those six uses when found compatible. While allowing target shooting may in some circumstances contribute to a more humane kill in a hunting scenario, in its entirety, such an activity is not a wildlife-dependent priority public use nor does it further enhance the public's understanding and appreciation of the refuge's natural or cultural resources. In addition, this use would pose safety and environmental concerns beyond the refuge's capacity to administer. Furthermore, the exact opportunity desired by local users is already available within a few miles of the division on the neighboring WMA and private timber lands.

Target shooting on a national wildlife refuge is also not consistent with Federal regulations and policies. 50 CFR §27.41-27.42 states the following:

§ 27.41 General provisions. Carrying, possessing, or discharging firearms, fireworks, or explosives on national wildlife refuges is prohibited unless specifically authorized under the provisions of this subchapter C.

§ 27.42 Firearms. Only the following persons may possess, use, or transport firearms on national wildlife refuges in accordance with this section and applicable Federal and State law:

(a) Persons using firearms for public hunting under the provisions of 50 CFR part 32.

(b) Persons carrying unloaded firearms, that are dismantled or cased, in vehicles and boats over routes of travel designated under the provision of subchapter C.

(c) Persons authorized to use firearms for the taking of specimens of wildlife for scientific purposes.

(d) Persons authorized by special regulations or permits to possess or use firearms for the protection of property, for field trials, and other special purposes.

For these reasons, we have determined that allowing this use is not consistent with the Service policy on the appropriateness of refuge uses.

## REFERENCES:

Cao X, Ma LQ, M. Chen, D. W. Hardison, Jr., and W.G. Harris. 2003. Weathering of lead bullets and their environmental effects at outdoor shooting ranges. J. Environ. Qual. 2003 Mar-Apr; 32(2):526-34.

National Shooting Sports Foundation. 1997. Environmental Aspects of Construction and Management of Outdoor Shooting Ranges. 125 pp.

**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Camping Along the Nulhegan River in Support of the Northern Forest Canoe Trail

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Camping Along the Nulhegan River in Support of the Northern Forest Canoe Trail

## NARRATIVE:

Throughout its 740-mile length, the Northern Forest Canoe Trail (NFCT) maintains many low-intensity infrastructure needs (e.g., launches, portage trails, campsites) for paddlers. This proposal is to build a tent site along the Nulhegan River to serve both through paddlers (i.e., those completing the full 740-mile length), as well as those who choose to paddle shorter segments. The site will consist of a 20-by-20-foot cleared area, with a seasonal log ladder to allow access from the river, picnic table, privy, and space for two tents. The use will be administered with a special use permit (SUP) granted to the NFCT. The SUP will contain requirements governing the use of the site, as well as those necessary to ensure compatibility.

Across the trail network, NFCT has projected a 5-mile spacing of campsites to accommodate projected use levels. This proposed campsite would fill a 15-mile gap between Brighton State Park (10 miles upstream and the Bloomfield campsite 5 miles downstream). In addition to being somewhat centrally located within this reach, the proposed site is the only location with relatively easy access for a land-based trail maintainer, yet far enough from a roadway to discourage misuse of the site.

Establishment of this campsite will provide a means to reach a user group who may otherwise be only peripherally aware of the refuge and National Wildlife Refuge System (Refuge System). More specifically, with the creation of a short spur trail, the campsite can link to the Nulhegan River Trail, which accesses the division's visitor contact station. Paddlers can therefore have an opportunity to view the exhibits and talk with staff, thereby becoming better informed about the refuge, the Refuge System, and the collective conservation mission. Finally, establishment of the campsite can futher the already strong partnership with NFCT and be of mutual benefit to both entities. For these reasons, we have found that creating a campsite along the Nulhegan River contributes to the purposes for which the refuge was established and the mission of the Refuge System and, therefore, is an appropriate refuge use under the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILITY DETERMINATION

## USE:

Camping Along the Nulhegan River in Support of Northern Forest Canoe Trail

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES)

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is it a priority public use?**
The use is overnight camping at a designated site along the Nulhegan River. Camping is not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). Camping is a secondary use that facilitates and supports wildlife-dependent priority public uses including fishing, hunting, wildlife observation, and photography.

**(b) Where would the use be conducted?**
A campsite will be developed on a flat river terrace on the south shore of the Nulhegan River. The site will be approximately 100 feet from the shore of Nulhegan River and 650 feet from the Nulhegan River Trail and provide visitor access to the division's visitor contact station (map D.1).

**(c) When would the use be conducted?**
The campsite will be available for use during the typical paddling season: May 1 through October 31. The site will be closed to camping outside of these dates.

**(d) How would the use be conducted?**
The campsite will contain similar amenities and resemble similar Northern Forest Canoe Trail (NFCT) campsites along the 740-mile trail network. The campsite will be established in a flat area along the river shoreline. Woody vegetation will be cut at ground level within an approximately 20-by-20-foot area. Grasses and forbs will remain and their continued growth will be encouraged to maintain soil stability. The site will contain a seasonal floating log ladder placed along the river's edge to allow safe access to the site, privy, picnic table, and informational/directional signage. The site will be administered and maintained by the NFCT pursuant to a special use permit (SUP). The permit will specify maintenance and hygiene standards. Drinking water is not provided. No trash pick-up is provided and campers must carry out all trash.

Campsite regulations consist of the following:

- The site is available on a first-come basis.
- The maximum number of tents allowed is two.
- The maximum length of stay is 2 nights.
- The maximum number of people occupying the campsite is 6.
- Quiet hours are from 10 p.m. to 7 a.m.
- Pets are permitted, but must be leashed.
- No fires are allowed.

We list additional refuge-specific regulations below under the section "Stipulations Necessary to Ensure Compatibility."

The NFCT has developed a tiered system for maintaining the trail and building needed infrastructure. Each year they rely on the following sources to accomplish work across the NFCT:

- **Trail Maintainer Program:** The NFCT has been divided into 10- to 15-mile adoptable segments. Trail Maintainers visit their trail segments a minimum of twice a year to perform general maintenance and observe and report trail conditions to the NFCT Trail Director.

- **Stewardship Intern Program:** A crew of four interns and one field coordinator perform trail infrastructure work across the NFCT. A minimum of one project is performed in each state. The Stewardship Intern Crew also supports all Waterway Work Trips (weekend projects with up to six additional volunteers).

- **Contracted Projects:** For larger projects involving heavy equipment or over 4 weeks of crew time the NFCT will contract with professional trail builders or construction workers as needed.

The NFCT relies on Landowner Agreement Forms to describe the stewardship plan for the parcel and outline the responsibilities of the NFCT.

**(e) Why is this use being proposed?**
The NFCT is a 740-mile water trail, linking Old Forge, New York, to Fort Kent, Maine. Trail use occurs under two categories; through paddlers (traveling the entire length of the NFCT in one expedition) and section paddlers (paddlers performing day or overnight trips on sections of the NFCT). Through Paddler numbers average around 20 a year, with slight increases most years since the NFCT was established in 2006. With the

installation of sign-in boxes in 2012, they will be able to obtain more accurate data for section paddlers. The Nulhegan River has not in recent times been a very active paddling corridor. The NFCT has brought increased activity to this corridor and current use is estimated at 50 to 60 paddlers per season. A majority of paddlers will extend their outing to several days, necessitating overnight accommodations. Throughout its length, the NFCT contains 456 campsites, most along the shores of lake and rivers. Providing such rustic amenities on the refuge will support this growing recreational use. Further, it will provide the U.S. Fish and Wildlife Service (Service) with an opportunity to engage with an additional outdoor recreation-based user group. Paddlers will have access to the division's visitor contact station, including its staff and exhibits. Providing this use will also support priority wildlife-dependent activities given that users often also participate in fishing and wildlife observation.

## AVAILABILITY OF RESOURCES:

The resources necessary to provide and administer this use are available within current and anticipated refuge budgets. The bulk of the cost will involve staff time to prepare and administer the SUP, and to maintain the spur trail. NFCT will maintain the integrity of the camp site amenties and keep the site clean.

We estimate below the annual costs associated with the administration of this use.

| | |
|---|---|
| *Spur trail maintenance:* | $800 |
| *Prepare and administer special use permit, general coordination with NFCT:* | $900 |
| *Camp site inspection/monitoring:* | $700 |
| **Total Annual Cost of Program:** | **$2,400** |

## ANTICIPATED IMPACTS OF THE USE:

We describe below the potential impacts of camping, as reported in the literature. Impacts may be locally quite severe, but are usually restricted to a relatively small area (i.e., the campsite itself) (Marion and Cole 1996). Significant impacts on vegetation and soil generally occur quickly, even with light use (Cole 1981). Much of the impact occurs when the campsite is first opened and during the first year of use.

**Soil:** Camping results in soil compaction and reduction in soil moisture content. It may reduce or remove the organic litter and soil layer, and run-off and soil erosion may increase. Those changes affect soil invertebrates and microbial processes, as well as inhibit plant growth. Fine-textured soils are particularly susceptible to compaction. Campsites with vegetated shorelines that are accessed by boat may also undergo shoreline erosion from the effects of repeated boat landings compacting soil and removing vegetation. Visitor use of the shoreline for fishing, swimming, dish washing, and collecting water may also trample vegetation, compact soil, and accelerate erosion. That erosion may expose tree roots, resulting in increased tree mortality due to wind throw. The presence of a 20-by-20-foot cleared area with a picnic table and privy will tend to concentrate the use of the campsite and limit campsite "creep." The refuge will work with NFCT to evaluate the condition of the campsite and to ensure the availability of signage to educate visitors about low-impact camping techniques.

**Vegetation:** The impacts of camping on vegetation are usually locally severe, even with low to moderate use. They include loss of ground vegetation cover, reduced vegetation height and vigor, loss of rare or fragile species, and changes in plant community composition (Leung and Marion 2000). Vegetation may be removed or trampled. Shrubs and trees are commonly lost from the site or damaged. Axes or fire may scar tree trunk, branches may be broken, bark removed or damaged, or nails placed in trees. Tree regeneration (seedlings and saplings) is generally lost, thus facilitating conversion to a non-forested site. Marion and Cole (1996) found on campsites they studied in Delaware that an average of 19 percent of trees had been felled and 77 percent of the standing trees had been damaged (primarily branches cut for firewood or trunks scarred by axes and nails). Such impacts should be reduced given the prohibition on campfires. Trampling resistant vegetation (often grasses or exotics) tend to replace existing understory vegetation (forbs) (Marion and Cole 1996).

The indirect effects of vegetation disturbance include microclimate changes and increased erosion. The extent of camping impacts on vegetation is generally related to the frequency sites are used, their durability, and group size (Cole 1995). Larger groups are usually responsible for enlarging campsites more than small groups (Cole 1992, Marion 2003). Campsite enlargement is particularly a problem when campsites are located on flat, open sites. Campers may also enlarge the affected area by developing multiple, uncontrolled "social trails" between tents, to water sources, to viewing points or favored fishing locations. Some visitors have a much greater impact on vegetation than others, because they are more likely to cut down vegetation, dig trenches around tents, and otherwise modify the sites. Many of these potential impacts will be mitigated with this proposal given that only a single site will be developed and it will be limited to two tents, hence a small group size. Riverside camping will be permitted only at a single designated campsite, so any disturbance to vegetation will be limited to a small area of the refuge.

**Water Quality:** Improperly disposed human and pet wastes at campsites may compromise water quality by introducing pathogens, and affect campsite aesthetics. Human waste, food disposal, and dishwashing may increase aquatic nutrient loads. That may result in limited, localized increases in algal growth, facilitating oxygen depletion and altering the composition of aquatic vegetation and invertebrate communities. Run-off from eroded campsites can increase turbidity and sedimentation, which may affect fish and invertebrates (Marion 2003, Leung and Marion 2000). Soap from improper dishwashing, trash, and fish-cleaning waste, may all pollute water and have an aesthetic impact. Pit toilets located near water on shallow, permeable soils can sometimes introduce coliform bacteria into the water (Hammitt and Cole 1998). However, camping generally does not affect water quality to the extent of creating a public health concern, even in areas that receive heavy use (Cole, 1981).

The NFCT will be responsible for maintaining the campsite and privy. The refuge will cooperate with the NFCT in providing educational outreach on low-impact washing methods and proper waste disposal.

**Wildlife:** Camping can alter or destroy wildlife habitat, or displace wildlife from preferred habitat or resources (food, water, nest sites). Camping may also modify or disrupt wildlife behavior. Larger groups are generally more likely to disturb wildlife (Marion 2003).

Human visitors or their pets may "harass" wildlife. Even leashed pets may disturb wildlife. Pets may also transmit diseases to wildlife (Hammitt and Cole 1998). Disturbance related to camping may also affect wildlife health, fitness, reproduction, and mortality rates (Leung and Marion 2000).

Indirect effects may include a change in vertebrate species composition near the campsite. Changes in vertebrate communities at campgrounds (as compared to control sites) have been reported for birds (Blakesley and Reese 1988, Garton et al. 1977, Foin et al. 1977, Knight and Gutzwiller 1995) and small mammals (Clevenger and Workman 1977). In the case of songbirds, changes in species composition were due primarily to a reduction in ground cover vegetation (for nesting, feeding) at campsites and different levels of sensitivity to human disturbance. Rarer species are generally absent from campgrounds.

The presence of humans attracts some species, while others avoid it. The availability of food generally differs between campgrounds and undisturbed areas. Natural foods may decrease in availability while foods supplied by humans may increase. Humans may intentionally supply foods to wildlife, or unintentionally, because of littering, accidental spillage, or improper food storage (Garton et al. 1977). Human foods may be unhealthy for wildlife or promote scavenging behavior, which may increase vulnerability of animals to predation. Rodent populations often increase at campsites, in response to increased availability of human food, and may negatively affect nesting songbirds. Bears and other scavengers may be attracted to improperly stored food and may damage property or threaten visitor safety.

Only leashed pets will be permitted at the campsite. The refuge will work with the NFCT on managing the campsite and providing outreach to the public on how to avoid disturbing wildlife and the importance of not feeding wildlife and storing food properly.

**Visitor Conflicts:** Conflicts may arise between visitors as a result of noise and over-crowding. Conflicts may also develop between small and large groups and different user groups (fishermen, hunters, wildlife

photographers, etc.). Litter, noise, large group sizes, and crowding may impair the refuge experience for some visitors. The campsite will be located at the end of a proposed spur trail and occupancy will be limited to two tents. Therefore, conflicts with other users are not anticipated to be significant. Public outreach may help reduce potential conflicts by reducing littering and promoting considerate camping. The refuge will work with the NFCT to adjust camping policies, should this issue become significant.

Overall, the impacts associated with this use would be confined to a minute portion of the refuge, in the immediate vicinity the campsite. Seasonal closures, when warranted, and the stipulations listed below, should ensure that disturbance of wildlife and impacts on refuge resources are minimal.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Camping is only allowed at the designated campsite only.
- The campsite will be open to use only between May 1 and October 31.
- Only leashed pets will be permitted at the campsite.
- No fires will be allowed.
- No wood gathering or vegetation removal is permitted.
- No digging or trenching will be permitted.
- Feeding of wildlife is not permitted.
- All trash must be carried out.
- NFCT will help manage the campsite under a SUP.
- In cooperation with the NFCT, we will implement best management practices for preventing campsite expansion and managing waste.
- We will place a sign at the campsite explaining refuge regulations and minimal impact camping techniques. The refuge will work with the NFCT to provide additional outreach on “leave no trace” camping.
- Per the description in figure D.1, we will monitor the impacts of camping, the condition of the shoreline and campsite, and the potential for wildlife disturbance yearly, and work with the NFCT to minimize impacts or restore sites. Based on the outcome of those surveys, we may adjust our management of the

site.

## JUSTIFICATION:

Camping provides an increased opportunity for the public to participate in priority public uses in a remote setting. Providing the public with an opportunity to experience the refuge wildlife and natural resources through camping, along with a public educational outreach program, will help motivate visitors to understand and develop a commitment to protecting healthy ecosystems. Experiencing the refuge through camping and education are tools that can help build a land ethic, develop political support, and lessen vandalism, littering and poaching. We expect the impacts of camping on vegetation and wildlife to be minor and localized. With the stipulations noted above, camping will be compatible with refuge purposes.

Based on the limited detrimental impacts of this use, the stipulations above, and a long history of use, overnight camping at current levels will not materially interfere with or distract from the mission of the Refuge System or the purposes for which the refuge was established.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

## LITERATURE CITED:

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*Map D.1. Proposed Northern Forest Canoe Trail Campsite at Nulhegan Basin Division.*

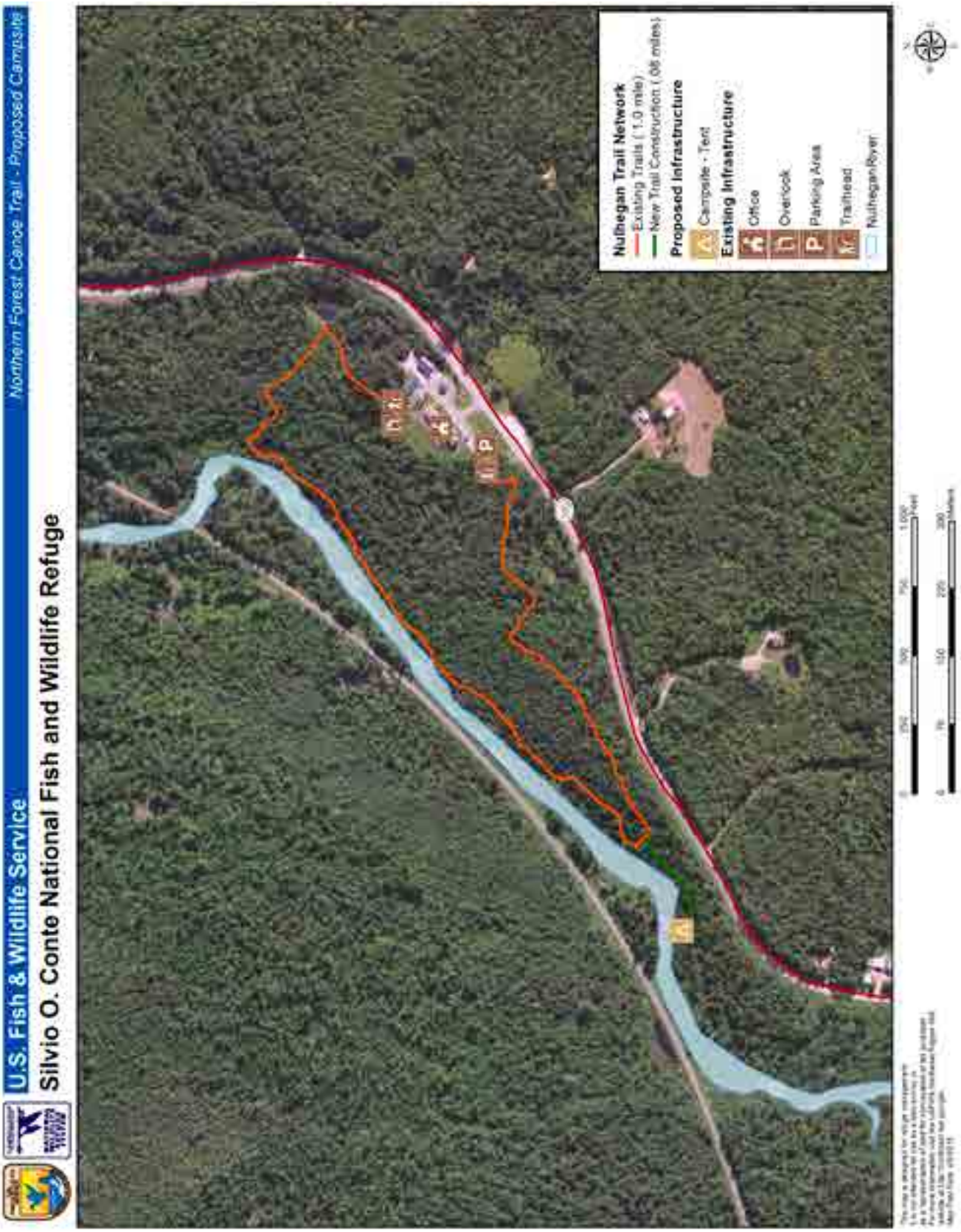


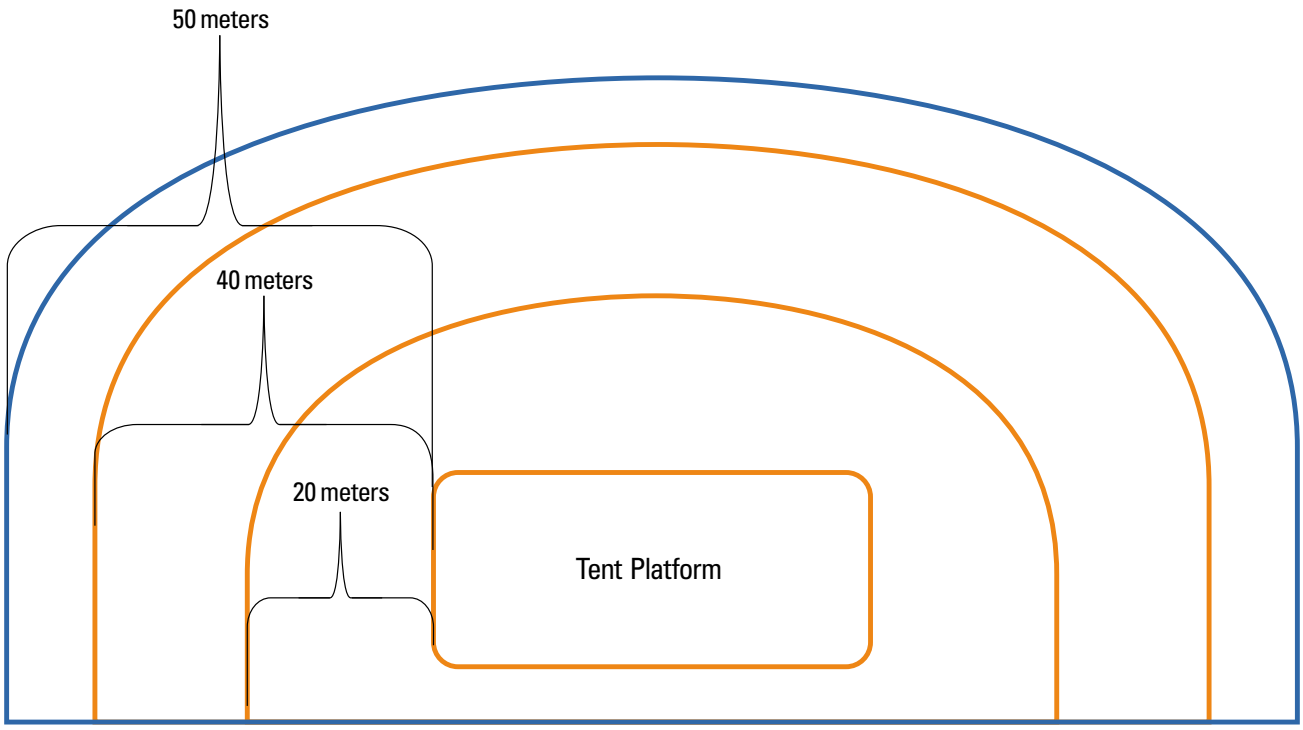
**Figure D.1. Acceptable Impact Thresholds for Camping.**

**Acceptable Impact Thresholds**

| Distance | Loss of herbaceous | Increase bare soil | Loss of leaf litter | Seedlings and saplings |
|---|---|---|---|---|
| 0-20 | 75% | 75% | 75% | 75% |
| 20-40 | 25% | 25% | 25% | 25% |
| 50 | 10% | 10% | 10% | 10% |

Acceptable limits defined as the % cover increase in bare soil or % cover decrease in herbaceous veg. seedlings, saplings, and leaf litter beyond which the use remains compatible.

Ex. We will accept up to a 75% loss of herbaceous vegetation within the 0-20 meter radius of tenting activity. We will not accept 30% increase in bare soil between 20–40 meters from tenting activity.



**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Commercial Forestry for Habitat Management

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No _____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Commercial Forestry for Habitat Management

## NARRATIVE:

Forest management at Silvio O. Conte National Fish and Wildlife Refuge (refuge) is integral to meeting the refuge's wildlife habitat objectives. From a practical standpoint, the optimum means to achieve this goal is with commercial forest management, subject to management prescriptions prepared and overseen by the refuge forester. Commercial loggers have the capability to treat the acreages desired–and can do so most efficiently and economically. In many cases, commercial logging will attain our desired outcome at no cost to the refuge and a slight financial gain for the American public.

Initial efforts will focus on larger areas, such as the Nulhegan Basin Division, where management will offer the greatest benefit to forest-dependent migratory birds. However, additional refuge lands are being considered for forest management: in Vermont–Putney Mountain Unit; in New Hampshire–Pondicherry and Blueberry Swamp Divisions; in Massachusetts–Dead Branch Division; and in Connecticut–Salmon River Division.

Commercial forest management is considered to be an economic use under 50 CFR. 29.1. Therefore, this use must contribute to the purposes for which the refuge was established or the mission of the National Wildlife Refuge System (Refuge System). Forest management provides the array of vegetation types, successional stages, and structural attributes desired for our forest-dependent trust species. In this way, commercial forest management contributes to goal 1 of the refuge's draft Comprehensive Conservation Plan (CCP) and Environmental Impact Statement (EIS), which states that the refuge will provide and promote through active management a diversity of successional forested habitats for the benefit of our focal wildlife species.

Commercial forest management facilitates the management of the refuge's forests and is not only a reasonable method, but the preferred method of meeting the habitat needs of forest-dependent birds. For these reasons, we have found commercial forest management contributes to the purposes for which the refuge was established and the mission of the Refuge System and, therefore, is an appropriate refuge use under the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILITY DETERMINATION

## USE:

Commercial Forestry for Habitat Management

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species, and the ecosystem upon which these species depend within the refuge.
- To protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is it a priority public use?**
Commerical forest management will be performed for the primary purpose of creating and/or improving wildlife habitat to ensure a diversity of forest structure and composition. Commerical forest management is not a priority public use, but contributes to the refuge's purposes and habitat and species goals when conducted to manage and improve habitat for wildlife. Commercial forest management may include a variety of accepted silvicultural practices, such as thinnings and release cuttings to remove pole, pulpwood or firewood;

regeneration cuts such as seed tree, selection, or shelterwood cuts, which would yield products ranging from pulpwood to saw timber; and salvage cuts performed as a result of storm, insect or disease damage which could result in the sale of any or all of the above mentioned forest products. Commercial management practices are the preferred method to safely and efficiently manage refuge forests in a cost-effective manner. It is impractical for the refuge to acquire the necessary equipment and staff to efficiently conduct these management actions.

**(b) Where would the use be conducted?**
The refuge contains forested tracts on most of its existing 16 divisions and units, making forest management possible throughout the refuge. Initial efforts will focus on larger tracts that were harvested most recently from previous owners, and whose management will offer the greatest benefit to forest-dependent migratory birds. The Nulhegan Basin Division (greater than 26,000 acres) makes up the majority of the refuge's forested land base, and most forest management will occur on that division. The following additional refuge lands are being considered for forest management to improve wildlife habitat: in Vermont–Putney Mountain Unit; in New Hampshire–Pondicherry and Blueberry Swamp Divisions; in Massachusetts–Dead Branch Division; and in Connecticut–Salmon River Division.

**(c) When would the use be conducted?**
Forest management may occur at different times and at different locations, depending on individual site characteristics, stand conditions, and other resource concerns. All forest management will occur at times designed to minimize unwanted impacts on resources (e.g., erosion, soil compaction, or the disturbance of wildlife), while maximizing the desired silvicultural results, such as seed germination and natural tree regeneration. A comprehensive forest inventory–evaluating forest habitat and wildlife species of concern–will aid in determining the appropriate timing for forest management.

**(d) How would the use be conducted?**
A comprehensive forest inventory–evaluating forest habitat and wildlife species of concern–will aid in determining which stands on the refuge will benefit from active forest management. Stands will be managed to diversify forest age class and structure to benefit focal wildlife species (Seymour & Hunter Jr. 1992, 2000; Kenefic & Nyland 2000; Keeton 2006; Foster *et al.* 2010). A variety of commercial and non-commercial timber harvesting may occur as described below. All harvesting will follow best forestry and wildlife management practices (BMPs) recommended by the respective state forestry agency (Bennett 2010). This includes protections for wetlands, hydric soils, and streams. More detailed silvicultural treatments are outlined in the Conte Refuge CCP; stands identified for active forest management within each ownership will be detailed in each division's Habitat Management Plan (HMP).

Forest management activities will be directed by each refuge division's HMP. The specific treatment prescriptions are "stepped down" from the HMP. Where commercial forest management is warranted, those activities are performed by a logger operating under a special use permit (SUP). Project prospectus and specifications are forwarded to local and regional logging companies for competitive bidding. The refuge manager will select a logger based on meeting qualifications and requirements in the project prospectus. The refuge manager will issue the selected operator a SUP and the refuge forester will supervise the forest management operation. Active harvest operations may include felling trees, skidding them to a landing, processing the trees, loading logs or wood chips on trucks, and hauling the wood products offsite. Forest management treatments (e.g., trees targeted, spacing, residual tree density, harvest method, etc.) are dictated by a silvicultural prescription developed by the refuge forester with input from the refuge biologist, and approved by the refuge manager.

All activities under this special use permit process are regulated by provisions listed in 50 CFR (subpart D-Permits, 25.41–45). The permittee would be required to comply with all Department of the Interior, U.S. Fish and Wildlife Service, and Federal, State, and local laws in the conduct of their business. Because this is an economic use of the refuge, it is also subject to other applicable laws and regulations (see 50 CFR 29.1). We would continue to follow the procedures for SUPs outlined in the Service's Refuge Manual (5 RM 17.11) and other applicable laws and regulations (see also 50 CFR 29.1) when selecting permittees and administering this use.

Within a specific division or unit, focal species have been identified and will act as drivers for active forest management. Where focal species-specific habitat conditions are missing, and may be created through active forest management, those areas will be prioritized for treatment. Division-specific focal species are

discussed in great detail in appendix A of the Conte Refuge draft CCP/EIS. As a hypothetical example, forest management within a red spruce-northern hardwood (or mixedwood) stand, using crop tree release and canopy gap formation, will increase understory density and enhance the component of softwood species, benefiting focal species Canada warbler and blackburnian warblers respectively.

Silvicultural treatments will be designed to meet habitat objectives within particular forest types (spruce-fir, northern hardwood, oak-pine, etc.), while addressing site-specific operational constraints. Active management will help restore forest structure (Kenefic & Nyland 2000; Crow *et al.* 2002; Bryan 2003; Keeton 2006; Raymond *et al.* 2009; Arseneault *et al.* 2011) and species composition (Leak 1975, 2003, 2005; Arseneault *et al.* 2011), and improve a forests resiliency to environmental stressors like climate change (Hines, Heath & Birdsey 2010). Monitoring of forest systems and the impacts of forest management strategies will allow modification of management practices as necessary. Climate change may influence the trajectory of our forest systems in unpredictable ways, and adjustments to objectives and management strategies may occur. When feasible, management strategies will favor or increase the conifer component of stands on appropriate sites. Strategies are described below:

## Strategies for conifer-dominated habitat types

- Use commercial and non-commercial mechanical treatments, where and when appropriate to improve forest composition and structure. Treatments will favor retention and regeneration of red spruce where and when possible. Composition and structural goals will be driven by focal species habitat requirements.

- Manage this habitat type through accepted silvicultural practices. Methods may include:

  - Single tree or group selection with retention, overstory removal, clearcut, and shelterwood techniques.

  - Treatments timed to optimize the ability of the site to regenerate softwood.

  - When using even-aged treatments:

    - Rotation age for fir will range from 60 to 100 years.

    - Rotation age for spruce will range from 80 to 130 years.

  - The size of each management unit, its silvicultural prescription and rotation age will determine the size of each treatment and the cutting interval.

- Maintain a minimum of 50 percent of deer wintering area as quality shelter at any point in time. Quality shelter is defined as softwood cover over 35 feet tall with 70 percent or higher crown closure (Reay et al., 1990).

## Strategies for conifer-hardwood (mixed-wood) habitat type

- Use commercial and non-commercial mechanical treatments, where and when appropriate, to improve forest composition and structure. Treatments will favor retention and regeneration of red spruce where and when possible. Composition and structural goals will be driven by focal species habitat requirements.

- Manage this habitat type through accepted silvicultural practices. Methods may include:

  *On softwood-dominated sites (within the mixed-wood habitat type)*

  - Single tree or group selection with retention, overstory removal, clearcut, and shelterwood techniques.

  - Treatments timed to optimize the ability of the site to regenerate softwood.

  - When using even-aged treatments:

- ❖ Rotation age for fir will range from 60 to 100 years.
- ❖ Rotation age for spruce will range from 80 to 130 years.

❋ The size of each management unit, its silvicultural prescription and rotation age will determine the size of each treatment and the cutting interval.

❋ Emphasis on overstory removal techniques that protect softwood regeneration in areas of advanced softwood regeneration.

*On hardwood-dominated sites (within the mixed-wood habitat type)*

❋ Gap-based management (group selection) with retention, with variable group size.

❋ Re-entry intervals on the order of 10 to 20 years to promote new cohorts and maintain understory development.

❋ Promotion of increased compositional and structural heterogeneity, including dense canopies, large-diameter trees, and large-diameter coarse woody debris and snags.

## Strategies for the hardwood-dominated habitat types

- Use commercial and non-commercial mechanical treatments, where and when appropriate to improve forest composition and structure. Composition and structural goals will be driven by focal species habitat requirements.
- Manage this habitat type through accepted silvicultural practices. Methods may include:

❋ Single tree or group selection with retention, overstory removal, clearcut, and shelterwood techniques.

❋ Reentry intervals on the order of 10 to 20 years to promote new cohorts and maintain understory development.

❋ Promotion of increased compositional and structural heterogeneity, including dense canopies, large-diameter trees, and large-diameter coarse woody debris and snags.

❋ When using even-aged treatments:

- ❖ Rotation age for fir will range from 60 to 100 years
- ❖ Rotation age for spruce will range from 80 to 130 years.

❋ The size of each management unit, its silvicultural prescription and rotation age will determine the size of each treatment and the cutting interval.

**(e) Why is this use being proposed?**

The forests of New England have been significantly altered (Marsh 1864; Cronon 1983; Williams 1992; Whitney 1996). The kinds of trees present, their relative numbers, their age, and their distribution across the landscape are very different than what they would be if left to nature. The health and diversity of our forests have been reduced, making them less resilient to climate change, disease, invasive species, and natural events.

Restoration requires an active, hands-on approach, guided by science-based methods. It is an approach that includes tree-planting, harvesting timber, and prescribed burns in order to promote new generations of native trees. More specifically, forest management can improve and accelerate development of historic forest structure and species composition (Seymour, White & deMaynadier 2002; Keeton 2006; Franklin, Mitchell & Palik 2007; North & Keeton 2008; Raymond *et al.* 2009; Arseneault *et al.* 2011). In the absence of active management, the development of appropriate wildlife habitat may take longer or fail entirely, depending on site characteristics,

prior management history, and natural disturbance frequency. A forest can be actively managed through harvesting practices to mimic natural disturbances and create openings for young trees while also retaining some larger, older trees. This prescription will also maintain the appropriate forest structure and age or size classes important to focal species into the future, ensuring adequate habitat is always available for species of concern. The refuge lacks the funding, personnel, and equipment to effectively and efficiently manage our forested lands. Engaging private loggers as part of a commercial arrangement is the only practical alternative for accomplishing this work.

In summary, an active forest management program will improve refuge wildlife habitat while contributing to the forest-based economies of communities surrounding the refuge's divisions.

## AVAILABILITY OF RESOURCES:

The resources necessary to administer this use are available within current and anticipated refuge budgets. The refuge forester will design and oversee the timber management program, in consultation with the wildlife biologist and refuge manager. Current staffing plans and budgets account for these tasks.

A portion of funds generated by the sale of timber on refuge lands will go into the revenue sharing fund. Another portion will fund the forest management program, including additional stand inventories, timber marking, pre-commercial thinning, and related roadwork. When appropriate, infrastructure maintenance associated with timber sales, such as road maintenance, will be included as a deliverable in SUPs. This flexibility alleviates additional management costs associated with active forest management.

All harvesting is likely to occur near, or from, the existing road networks. There are no expected road construction costs associated with active forest management on refuge property. Funding will be necessary for road maintenance, including grading, installation and replacement of water control structures, etc. The refuge forester will assume contract development and administration, monitoring, and resource database management.

Outside of costs offset by timber sale receipts, required yearly costs to administer an active forest management program on refuge lands is listed below:

| | |
|---|---|
| *Develop prescriptions; circulate prospectuses for bid; sale layout; onsite representative with logger: Refuge Forester* | $9,000 (8 weeks/year) |
| *Review forest management actions; on-site monitoring (Refuge Biologist)* | $1,700 (1 week/year) |
| *Review proposals, issue special use permits (Refuge Manager)* | $1000 (2 days/year) |
| **Total Annual Cost of Program:** | **$12,000** |

## ANTICIPATED IMPACTS OF THE USE:

Commercial forest management to improve wildlife habitat on the refuge could have the following impacts:

### Soil Impacts

The construction and maintenance of roads and landings and the operation of heavy equipment may impact soil, causing rutting and erosion (Helfrich, Weigmann & Neves 1998; Wiest 1998; Cullen 2001). To mitigate potential impacts and minimize erosion, timber harvesting and road construction on the refuge will follow the best management practices as recommended by State forestry agencies in New Hampshire, Vermont, Massachusetts, and Connecticut. Soil disturbance following deforestation may increase the export of particulate matter and soil nutrients (Bormann *et al.* 1968, 1974). To reduce the potential for soil impacts, timber harvesting on the refuge will largely occur during winter months, when snow depths and cold temperatures reduce soil compaction and erosion. Special caution will apply in areas with hydric, steep, shallow, or easily erodible soils.

## Aquatic Resource Impacts

Forest management operations may have significant impacts on both water quantity and water quality. Data from forested experimental watersheds in the eastern United States indicate that leaching of nutrients after timber harvesting, especially clearcutting, tends to increase (Bormann *et al.* 1968, 1974), while increases in streamwater temperature are highest where regevetation of cutover areas is delayed (Demaynadier & Hunter Jr. 1995; Cullen 2001). These factors may have detrimental effects on stream organisms, including fish, invertebrates, and amphibians (Campbell & Doeg 1989). Poorly planned timber harvests and road construction can alter surface and groundwater hydrology and water storage capability. The effects of multiple harvests in a watershed can accumulate over time.

Maintaining forested buffers near streams and other aquatic resources minimizes impacts on water resources and water quality (Osborne & Kovacic 1993; Castelle, Johnson & Conolly 1994; Wilkerson *et al.* 2006; Bennett 2010). Road construction, skid trail planning, harvest operation and stream crossings will, at a minimum, follow the best management practices promulgated by each state's forestry agency to minimize the alteration of hydrology and the impacts of siltation on water quality. Harvesting will use existing forest roads whenever possible; construction of new roads will be kept to a minimum.

## Wildlife and Vegetation Impacts

Commercial forest management can have a number of localized and broader impacts on wildlife-related components of forests including: damage to understory vegetation (Scheller & Mladenoff 2002), alteration of microhabitat environments (Demaynadier & Hunter Jr. 1995), changes in the abundance and type of coarse woody debris (Demaynadier & Hunter Jr. 1995; Siitonen 2001), and removal of snags important to wildlife (*e-CFR*). Less downed wood and fewer large-diameter logs are likely to accumulate under a short-rotation (less than 50 years) harvest, whole-tree harvests, and selection cuts than would occur under long rotations or in uncut forests, affecting soil moisture regimes and forest floor amphibians and small mammals (Gore & Patterson III 1986; Demaynadier & Hunter Jr. 1995). Damage to uncut trees from heavy equipment may create entry points for invasion by insects or disease (Nichols, Lemin Jr. & Ostrofsky 1994). Harvesting may also leave the remaining trees more susceptible to wind throw (Ruel 1995), facilitate the spread of invasive plants (Sakai *et al.* 2001), and disturb wildlife temporarily (Demaynadier & Hunter Jr. 1995; Campbell, Witham & Hunter 2007; Holmes & Pitt 2007).

Mitigation of much of these impacts is possible through careful planning and implementation. Seasonal restrictions on harvesting will minimize disturbance of wildlife and damage to residual trees or understory vegetation. The careful layout of skid trails, the use of mechanical harvesters and forwarders, and the pre-harvest surveys of resources of concern will minimize impacts. Contracts will require contractors to leave an appropriate volume of tops, branches, and other downed wood onsite whenever possible.

Under refuge management, average forest age and size class, along with canopy closure will increase over the long term. Prescriptions will generally mimic the natural disturbance patterns common to the forest type being treated (Seymour and Hunter Jr. 2000; Seymour, White and deMaynadier 2002; Fraver, White and Seymour 2009). However, some species-specific management will require younger age classes be present on the landscape (Lambert & Faccio 2005; Donovan 2006; U.S. Department of the Interior, Fish and Wildlife Service 2006; Chace, Faccio & Chacko 2009). In northern divisions, the component of softwood-species within refuge matrix forest will increase. Habitat connectivity will increase; fragmentation of forested habitats will decrease.

The northern long-eared bat (*Myotis septentrionalis*) was recently listed as federally threatened under the Endangered Species Act because of the devastating impacts of white-nose syndrome (80 FR 17974-18033). All of the current refuge units and divisions and proposed CFAs are in the northern long-eared bats historic range. When the species was listed, the Service issued an interim 4(d) rule that states: "In areas currently known to be affected by [white-nose syndrome], all incidental take prohibitions apply, except that take attributable to forest management practices…and limited tree removal projects shall be excepted from the take prohibition, provided these activities protect known maternity roosts and hibernacula. Further, removal of hazardous trees for the protection of human life or property shall be excepted from the take prohibition." The rule then outlines the following specific stipulations that exempt forest management from the prohibition on take:

- For such take to be excepted, the activity must:

  ❋ Occur more than 0.25 mile (0.4 kilometer) from a known, occupied hibernacula.

  ❋ Avoid cutting or destroying known, occupied roost trees during the pup season (June 1 to July 31).

  ❋ Avoid clearcuts (and similar harvest methods, e.g., seed tree, shelterwood, and coppice) within 0.25 mile (0.4 kilometer) of known, occupied roost trees during the pup season (June 1 to July 31).

We do not expect any negative impacts to northern long-eared bats from forest management on the refuge because we will follow the stipulations outlined in the 4(d) rule and will also continue to consult with the Service's Ecological Services program to ensure our habitat management does not negatively impact the species.

### Visitor Impacts

Logging may disturb refuge visitors, cause safety issues, or detract from visitors' aesthetic experience. When safety considerations warrant, areas of the refuge undergoing active management will be temporarily closed. Trails will either be closed or shared with logging trucks depending on the availability of feasible alternatives. Because small portions of the refuge's acreage will be actively harvested at any one time, impacts to visitors will be minimal.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Protection of refuge resources of concern is the top priority. Active management will follow the best management practices for wildlife habitat and timber harvest recommended by each State's forestry agencies: Vermont Department of Forests, Parks, and Recreation; New Hampshire Department of Resources and Economic Development - Division of Lands; Massachusetts Department of Conservation and Recreation; and the Connecticut Department of Energy and Environmental Protection.

- Where federally listed species occur, forest management activities may require Section 7 consultation under the Endangered Species Act. To protect the federally threatened northern long-eared bat, forest management activities must:

  ❋ Occur more than 0.25 mile (0.4 kilometer) from a known, occupied northern long-eared bat hibernacula.

  ❋ Avoid cutting or destroying known, occupied northern long-eared bat roost trees during the pup season (June 1 to July 31).

  ❋ Avoid clearcuts (and similar harvest methods, e.g., seed tree, shelterwood, and coppice) within 0.25 mile (0.4 kilometer) of known, occupied roost trees during the northern long-eared bat pup season (June 1 to July 31).

- State recommended best management strategies and buffer distances will be implemented as appropriate. In some instances, the refuge may exceed state recommendations for specific resource protection objectives.

- Roads, skid trails, water crossings, and landings will be sited to minimize damage to resources; roads and skid trails will be stabilized after harvesting.

- Snags, live cavity trees, and large coarse woody debris will be retained, as appropriate, to meet refuge objectives. The creation of snags, live cavity trees, or coarse woody debris, or the removal of individual trees or groups of trees may occur in any area of the refuge for specific wildlife management or safety purposes at the discretion of the refuge forester.

- Resource surveys identifying items of concern will be a consistent part of pre-management planning efforts. During management activities impacts to resources of concern will be minimized or eliminated.

- Active forest management will occur when site-specific soil conditions are appropriate to minimize negative impacts to soils and water quality. Timing of management activities will minimize impacts on wildlife (e.g., outside raptor or colonial bird nesting seasons). The refuge manager reserves the right to temporarily suspend harvesting operations during such times as these activities would result in serious consequences to forest soils.

- The SUP holder will ensure that all equipment is maintained such that hazardous waste (e.g., oil, hydraulic fluid) does not come into contact with the ground. If there are any spills, clean-up will commence immediately.

- The permittee is required to clean all harvesting equipment prior to transport onto the refuge to prevent introduction of nonnative plant species. Use of a high pressure washer is highly recommended. Prior to entering upon refuge property, equipment may be inspected by the refuge for presence of plant material, seeds, etc. Equipment presenting a high risk of contamination may be cleaned and re-inspected before being allowed on the refuge property.

- Location of access roads, major skid trails, and log landing or yards shall be approved by the refuge before establishment and/or use.

- The refuge manager may modify the SUP to protect any sensitive cultural resources area, object of antiquity, artifact, or similar object which is entitled to protection under the Antiquities Act of 1906, Archeological Resources Protection Act of 1979 and National Historic Preservation Act of 1966. Discovery of such areas or objects by either party shall be promptly reported to the other party.

- The permitee shall take all reasonable and practical action to prevent fires resulting from the permittee's operations. The refuge manager may suspend operations in the case of high fire danger.

- When management outcome allows, whole-tree harvesting will be discouraged. Contractors will be required to leave tops, branches, and other wood debris onsite.

- Any forest management on hydric soils will occur during frozen conditions. Slopes over 30 percent will forbid the use of any heavy equipment.

- Except at the refuge manager's discretion to meet specific management objectives for wildlife or habitat, no forest management will occur in the following forested wetlands: floodplain forest, northern white cedar, black spruce, and hardwood swamps.

- The permittee will be required to maintain the appropriate level of liability and workers' compensation insurance and to indemnify and save harmless the Government from claims as specified in the project-specific SUP.

- All operations in connection with harvesting and the removal of timber shall be subject to fire, safety, security, and other rules and regulations necessary for the protection of the Government personnel and property as may be prescribed by Government officials. All operations must conform to Occupational, Safety, and Health Administration (OSHA) requirements for logging safety standards as prescribed in 29 CFR part 1910.266 and 29 CFR part 1910.47 and 29 CFR part 1910.1200.

- The permittee shall provide the Service with copies of scale receipts upon request. The Service reserves the right to stop logging operations if proper scale receipts are unnecessarily delayed.

- Other project-specific stipulations may be included in SUPs.

## JUSTIFICATION:

This use is determined to be compatible, provided the stipulations necessary to ensure its compatibility are implemented. Commercial forest management to improve wildlife habitat will contribute to the purposes for which the refuge was established and the mission of the Refuge System, and facilitate the ability of the refuge to meet its wildlife management objectives. The use will not pose significant adverse effects on refuge resources, interfere with the public use of the refuge, or cause an undue administrative burden. The forest management program may adapt to insure its continued compatibility. Forest management will not materially interfere with, or detract from the mission of the Refuge System or the purposes for which the refuge was established; commercial forest management will not occur in any areas inhabitated by federally threatened or endangered species, except in limited cases where doing so may benefit those species. Commercial forest management will contribute to the refuge's purposes and help meet refuge habitat and species goals by improving habitat conditions for native wildlife species, particularly forest-dependent migratory birds.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Commercial Guiding for Wildlife-dependent Recreation

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No _____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Commercial Guiding for Wildlife-dependent Recreation

## NARRATIVE:

Refuge visitors enjoy participating in wildlife-dependent priority public uses (e.g., wildlife observation and photography, hunting, and fishing), but many may not have the local knowledge, skills, or equipment to come to Silvio O. Conte National Fish and Wildlife Refuge and engage in these activities. Commercial guides would help facilitate a safe and high-quality priority public use experience, and facilitate observation and appreciation by participants and observers of the refuge's wildlife, habitats, and conservation programs.

By allowing this activity, refuge staff anticipates more visitors would be exposed to the refuge and the National Wildlife Refuge System (Refuge System), and this exposure may lead to a better understanding of the importance of the Refuge System to wildlife conservation and to the American people.

For these reasons, we have determined that commercial guiding is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILTY DETERMINATION

## USE:

Commercial Guiding for Wildlife-dependent Recreation

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority use?**
The use is commercially guided priority public use activities (hunting, fishing, wildlife observation, photography, environmental education, and interpretation). Commercial guiding is the act of accompanying or assisting any person engaged in a wildlife-dependent public use, in exchange for remuneration for those services.

To date, only a few individuals interested in offering this service have inquired about obtaining special use permits (SUPs), and citizens have occasionally inquired about the availability of such services. Only priority public use activities (hunting, fishing, wildlife observation, photography, environmental education, and interpretation) are covered by this determination. Requests for any additional activities would be considered in the future on a case-by-case basis.

Commercial guiding is not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997. Commercial guiding can contribute to the fulfillment of refuge purposes and to the Refuge System Mission by facilitating priority and/or compatible public uses.

**(b) Where would the use be conducted?**
These activities take place on all refuge divisions open to the identified public uses, including lands acquired in the future pursuant to the final comprehensive conservation plan (e.g., McConnell Pond tract at Nulhegan Basin Division, or any of the conservation focus areas). The same areas currently used by non-guided visitors for wildlife observation, wildlife photography, hunting, fishing, environmental education, and interpretation would therefore also be available for commercially guided visitors. Although current use levels are modest, if user conflicts arise in the future, commercial activities could be restricted to certain areas or times to minimize such conflicts. Refuge approval and a SUP are required for access outside of these areas.

**(c) When would the use be conducted?**
These activities would take place year-round, subject to the refuge-specific regulations or laws governing the individual public use. Commercial guiding would only occur during daylight hours (one-half hour before sunrise until one-half hour after sunset). The refuge must approve any requests for guiding outside of these hours. If approved, the hours permitted will be included in the SUP.

**(d) How would the use be conducted?**
With the exception of the ability to charge guests for services rendered, this use will not impart any additional privileges beyond those available to all refuge users. Commercial guides would be allowed to operate on refuge lands through a formal process, including the issuance of a SUP. The refuge manages commercial guiding activities at a level that is compatible with refuge purposes and that ensures high-quality guiding services are available for the public. If approved, SUPs would be mailed within 2 weeks of the request. If not approved, the entire application package (including the payment check) would be returned via mail. Application packages containing false statements or fraudulent or misleading information will be denied and the application fee will be forfeited.

All SUP activities are regulated by provisions listed in 50 CFR, subpart D-Permits, 25.41 - 45. The permittee would be required to comply with all Department of the Interior, U.S. Fish and Wildlife Service (Service), and Federal, State, and local laws in the conduct of their business. Because this is an economic use of the refuge, it is also subject to other applicable laws and regulations (see 50 CFR 29.1).

The number of permittees for a particular activity is not presently limited by the refuge; however, restrictions may be placed on the quantity, time, and location of activities as deemed appropriate to sustain the resource and the quality of experience for other refuge visitors. If we determine that limits on the number of permittees is necessary, we would follow the procedures outlined in the Service's Refuge Manual (5 RM 17.11) and other applicable laws and regulations (see also 50 CFR 29.1) when selecting permittees and administering this use. Whenever possible, these restrictions would be clearly explained on the permit; however, the refuge reserves the right to enforce further restrictions or to change the restrictions by amending the permit at any time during the permit period when deemed appropriate for the protection of the resource and the quality of experience for the general public.

Commercial guiding may be conducted by automobile and bicycle on designated refuge roads open to these uses. It may also be conducted by boat in waters open to boating. Commercial guiding can also occur by foot, snowshoe, and cross-country skis in areas of the refuge open to these uses. Visitors participating in approved public uses are generally allowed off trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, and cross-country skiing).

The permittee must comply with the refuge regulations and SUP conditions listed under "Stipulations Necessary to Ensure Compatibility," unless an exception is allowed in the SUP.

**(e) Why is the use being proposed?**
We would allow commercial guiding to facilitate and enhance the experience of visitors while participating in wildlife-dependent priority public uses because many visitors may not have the knowledge, skills, confidence, or equipment to explore the division and engage in these activities on their own. Commercial guides would help facilitate a safe and high-quality priority public use experience, and facilitate observation and appreciation by participants and observers of the division's wildlife and habitats. Because it will generate a minimal amount of economic activity, this use is also likely to be supported by the local communities, especially communities in northern Vermont and New Hampshire where economic activity is limited, and as such engender support for the refuge. Because commercial guiding is considered an economic use, per Federal law (see 16 USC 715s) and Service regulations (50 CFR 29.1), we may only allow economic uses of a refuge natural resource where the use contributes to achieving refuge purposes or the Refuge System mission.

## AVAILABILITY OF RESOURCES:

The staff time associated with administering the use will primarily be related to processing annual SUPs, answering questions of Permitees concerning permit conditions, monitoring compliance with permit conditions, and monitoring potential impacts of the use on division's resources and visitors. The use will be administered by the wildlife refuge manager. Resource impacts will be monitored by the wildlife biologist, and the federal wildlife officer will monitor compliance with the SUP. No special or new equipment, facilities, staff, or resources are needed to administer this use.

We estimate below the annual costs associated with the administration of commercial guiding on the division.

| | |
|---|---|
| *Program Oversight* (wildlife refuge manager): | $1,200 |
| *Processing Special Use Permits/Monitoring Resource Impacts* (wildlife biologist): | $1,800 |
| *SUP compliance* (federal wildlife officer): | $1,400 |
| **Total Annual Cost of Program:** | **$4,400** |

Fees would be assessed with each permit, and shall be set, when possible, to recover the costs of administering specialized uses including guiding (Refuge Manual 17.8, 17.9).

## ANTICIPATED IMPACTS OF THE USE:

Commercial guiding of priority public uses can have positive or negative impacts to the division's wildlife and habitats.

The positive impacts of this use includes providing visitors with a better appreciation and more complete understanding of the division's wildlife and habitats, and perhaps engaging visitors who would not otherwise choose to experience the division due to their perception of its remoteness. This can translate into more widespread and stronger support for the refuge, the Refuge System, and the Service, as well as wildlife conservation in general.

The negative effects of this use includes impacts to plants, soils, hydrology, and wildlife from visitor participation in the six priority public uses–uses which are presently allowed and would occur with or without commercial guiding. The impacts associated with the priority public uses are discussed in detail under their respective compatibility determinations. Below is a summary of potential impacts associated with common aspects of the priority public uses, including certain methods of access.

### Vegetation impacts:

Pedestrian travel can have indirect impacts to plants by compacting soils and diminishing soil porosity, aeration, and nutrient availability that affect plant growth and survival (Kuss 1986). The entire Nulhegan Basin Division is available for pedestrian travel; visitors may navigate the myriad network of former logging roads, skid trails, and game trails, or they may simply "bushwhack" cross-country, whereas visitor access is restricted

at the other divisions. Most environmental education and interpretation visits will occur along hardened trails, so vegetation impacts are unlikely. With an estimate of fewer than 2,000 annual backcountry visits to the refuge's proposed 200,000 acre landscape, direct impacts to plants are not anticipated with the other priority uses.

People can be vectors for invasive plants when seeds or other propagules are moved from one area to another. The threat of invasive plant establishment would always be an issue requiring annual monitoring, and when necessary, treatment. Staff would work to educate the visiting public to reduce introductions and would also monitor and control invasive species.

Similar to the impacts to vegetation from foot travel, effects on vegetation from skiing and snowshoeing are expected to be minimal. Skiing and snowshoeing are limited to winter and require sufficient snow cover to allow access. Vegetation is largely dormant during the winter and would largely be protected by a surface layer of snow. In addition, skis and snowshoes are designed to distribute weight, decreasing the potential for compacting or eroding soils and trampling vegetation.

## Soils impacts:

Soils can be compacted and eroded as a result of continued use of pedestrian routes (Cole and Landres 1995). It is anticipated that some soil erosion would occur as a result of continuing pedestrian access on designated routes, which would most likely occur with guided environmental education and interpretation visits. Given the highly dispersed nature of wildlife observation, photography, hunting, and fishing, impacts to soils (erosion, compaction) are not likely to be significant at current and anticipated usage levels.

Effects on soils from skiing and snowshoeing are expected to be minimal. Skiing and snowshoeing are limited to winter and require sufficient snow cover to allow access. When these activities are occurring, soils also would largely be protected by a surface layer of snow. In addition, skis and snowshoes are designed to distribute weight, decreasing potential for compacting or eroding soils. However, given the time of year, locations, and methods used, skiing and snowshoeing are not expected to significantly affect soils on the refuge at current or projected levels of use.

The majority of boat use that occurs on the refuge is non-motorized through the use of canoes and kayaks. When motors are used they are either low horsepower or electric trolling motors and must adhere to a 5-mile per hour speed limit. Therefore we do not anticipate any significant bank erosion due to boat wakes.

## Hydrologic impacts:

Roads and trails can affect the hydrology of an area, primarily through alteration of drainage patterns. It is anticipated that existing roads and trails would continue to influence hydrology regardless of pedestrian travel. Maintenance would be required to create adequate and proper drainage to avoid hydrologic impacts. Trail construction may also cause erosion and run-off of sediment into nearby waterways from exposed soils.

Slight erosion may occur along the formal trails commonly used for environmental education and interpretation and some minor amount of sediment may enter waterways at those locations where trails adjoin streams. Properly sited, designed, and maintained trails minimize this impact. Based on the current and anticipated levels of use, pedestrian travel is not likely to significantly increase erosion, incision, or stream alteration. Therefore, no significant hydrologic impacts are anticipated from this use.

Motorboats and other pollutants, human waste, and litter can have negative impacts on water quality. Extensive water quality testing has not been performed at any of the divisions and therefore the levels of pollutants from boat fuel and impacts on local aquatic systems are unknown. Hydrocarbon contamination can be harmful to fish. Currently, boating activity is light and most is non-motorized so we feel there is little contamination coming from this source.

## Wildlife impacts:

Disturbances vary with the wildlife species involved and the type, level, frequency, duration and the time of year such activities occur. The responses of wildlife to human activities includes: avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993, Whittaker and Knight 1998), use of sub-optimal habitat (Erwin 1980, Williams and Forbes

1980), altered behavior or habituation to human disturbance (Burger 1981, Korschen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), attraction (Whittaker and Knight 1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Knight and Cole (1991) suggest recreational activities occurring simultaneously may have a combined negative impact on wildlife. Hammitt and Cole (1998) concluded that the frequent presence of humans in wildland areas can dramatically change the normal behavior of wildlife mostly through "unintentional harassment." These responses can have negative impacts to wildlife such as mammals becoming habituated to humans making them more susceptible to hunting mortality. Human induced avoidance by wildlife can prevent animals from using otherwise suitable habitat. Seasonal sensitivities can compound the effect of disturbance on wildlife. Both bird and mammal species which are present and active during the winter have the added environmental stressors of severe weather and food shortages, and can be more negatively affected than they would from the same level of disturbance during the warmer seasons (Hammit and Cole 1998). However, many migratory birds are not present in the winter, and most resident species are not breeding or raising young during the time of year when cross-country skiing and snowshoeing occur. Additionally, many mammal species are less active during winter months.

## Summary of impacts:

Opening the division to commercial guiding could result in a minimal increase in the number of visitors to the refuge and likewise increase the number of larger groups (4 or more people) visiting the various divisions. Resource impacts, however, are not expected to be any greater than those resulting from the existing, approved wildlife-dependent public uses. Commercial guides and their clients would be required to comply with all of the existing stipulations for authorized public uses. In addition, commercial guides would be required to comply with the stipulations noted below and would be routinely checked by the refuge's federal wildlife officer for compliance with regulations and permit conditions. Permit conditions and stipulations are designed to minimize potential impacts. Although a substantial increase in the cumulative impacts from public use is not expected in the near term, refuge staff would monitor impacts of this use and respond, if necessary, to conserve the existing high quality of refuge resources.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The following stipulations apply to SUPs issued for commercially guided recreational activities. Continuing law enforcement and administrative monitoring of permittees would be carried out to ensure compliance with the following conditions that are incorporated into all permits in order to minimize impacts on refuge lands and resources.

- Permittee agrees to hold the U.S. Government harmless from liability for any accident/injury to their clients or employees resulting from their activities being authorized by this permit. The permittee must provide adequate and appropriate liability insurance (a Certificate of Insurance with adequate Comprehensive General Liability coverage, the minimum limit of liability being $300,000 per occurrence). The insurance certificate must name the U.S. Fish and Wildlife Service as additional insured, as well as specify that the service/activity authorized by the permit is covered by the policy and must also provide a telephone number for verification purposes.

- The permittee must provide a copy of the appropriate documentation of current First Aid and CPR (cardiopulmonary resuscitation) certification for all guides.
- The refuge needs public use figures for end-of-fiscal year reports; therefore, SUP use figures must be turned in to the refuge by August 1 with estimates through September 30, and the following information must be reported: total number of trips, total number participants, and total fees.
- We reserve the right to limit the number of commercial guides and clients as needed.
- A copy of a valid SUP must be available for inspection by any law enforcement officer or refuge staff member, on request, whenever an activity authorized by the permit is occurring. Storing in the glove box of the vehicle may be acceptable; however, all guides must be knowledgeable about the permit and its conditions.
- Violation of (1) any special conditions of the SUP or (2) any Federal, State, local, or refuge regulations may result in a Notice of Violation being issued or revocation/cancellation of the permit without written or verbal warning. In that case, the permittee would receive immediate notification via phone with follow-up notification via mail. Permittees are responsible for the actions of their employees, agents, others working under their SUP, and their clients.
- No refund would be made to the permittee, regardless of the reason for revocation/cancellation of a permit.
- Canoe/kayak tour permits: Guides would be required to be knowledgeable in the identification and threats of aquatic invasive plant species. They would be required to inspect boats, trailers, and all associated boating equipment for the presence of plant material. All plant material must be removed and securely placed in zip lock bags prior to launching the boat or using associated equipment in refuge waters.
- For those businesses having held a previous year SUP, a current year SUP would not be issued until an accounting of tours/activities conducted under the old SUP has been received by the refuge office.
- SUPs are issued on a year-to-year basis and are not automatically re-issued on consecutive years.
- Permittee would provide all participants with information explaining the refuge, Refuge System and their missions, as well as, relevant permit regulations and conditions. The refuge would supply the necessary information to the permittee.
- Vehicle(s) would be used only on designated roadways and in parking areas.
- Guides would police their clients for litter, vandalism, etc. and report any problems to the refuge office.
- The use of electronic calls or baiting for the purposes of attracting wildlife is not allowed.
- Pursuing wildlife for purposes other than regulated hunting activities involving the intended take of game species (e.g., pursuit for purposes of wildlife observation or photography) is not allowed.
- Commercial guiding can occur during the refuge's open hours from one-half hour before sunrise until one-half hour after sunset. The refuge must approve any requests for guiding outside of these hours.

## JUSTIFICATION:

While few requests to offer commercial guiding have been received, it is possible that this niche, once available, will be filled by individuals and organizations with the skills necessary to provide quality fishing, hunting, and wildlife observation for guests. It is anticipated that even the minimal amount of economic activity represented by this use in those economically depressed areas within the Connecticut River watershed, will be welcomed by the local communities.

We have determined that allowing commercial guiding would not materially interfere with, or detract from, the mission of the Refuge System or the purposes for which the refuge was established. In fact, based on the analysis presented above, we have determined that allowing this use will contribute to the refuge's purpose, "[to] provide opportunities for…fish and wildlife oriented recreation and access to the extent compatible with the other purposes..." First, refuge visitors enjoy participating in wildlife-dependent priority public uses, but many may not have the knowledge, skills, or equipment to engage in these activities, particularly at the more remote divisions. Commercial guides may help facilitate a safe and high-quality priority public use experience, and facilitate observation and appreciation by participants of the refuge's wildlife, habitats, and conservation programs. Second, by allowing this activity, refuge staff hopes more visitors will be exposed to the refuge and the Refuge System, and this exposure may lead to a better understanding of the importance of the Refuge System to wildlife conservation and to the American people. These users may take the time to learn more about the refuge and become supporters of the Refuge System.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Commercial Haying to Manage Grassland Habitat

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No _____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Commercial Haying to Manage Grassland Habitat

## NARRATIVE:

Commercial haying at Silvio O. Conte National Wildlife Refuge (Conte Refuge, refuge) would be permitted in designated grassland management areas of the refuge. At this time the only areas managed with commercial haying are on the Fort River Division in Hadley, Massachusetts.

Commercial haying is considered to be an economic use under 50 CFR 29.1. Therefore, it must contribute to the purposes for which the refuge was established or the mission of the National Wildlife Refuge System (Refuge System). Haying cuts vegetation (primarily grass) from fields which otherwise continue to grow then become dormant following the growing season. Through time in the absence of mowing these fields would eventually succeed to shrub and forest habitats, at the expense of grassland habitats. Unlike nearby haying on commercial farmland, haying on the refuge would be conducted under a special use permit, which requires hay not to be harvested until after July 15. This allows ground-nesting, grassland-dependent birds to raise their broods and not lose their chicks to the harvesting machines. In addition, there are approximately 50 acres managed as herbaceous habitat (i.e. grass/forb) that are mowed by refuge staff to retain this habitat structure; however, these fields are mowed on a rotational basis, leaving a portion unmowed each year for nonbreeding season habitat.

Haying contributes to goal 1 of the refuge's draft Comprehensive Conservation Plan (CCP) and Environmental Impact Statement (EIS), which states that the refuge will provide and promote through active management a diversity of successional habitats, including grasslands, to sustain priority species. Additionally, haying by a local farmer frees up staff equipment operators to conduct required management activities elsewhere on the refuge. This saves the refuge time and money which may be allocated to different projects. In that sense, this use also benefits the refuge's other natural and cultural resources.

Haying facilitates the management of refuge grassland habitat and is not only a reasonable method, but sometimes is a preferred method of managing grasslands for nesting bird species. For these reasons, we have found commercial haying contributes to the purposes for which the refuge was established and the mission of the Refuge System and, therefore, is an appropriate refuge use under the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILITY DETERMINATION

## USE:

Commercial Haying to Manage Grassland Habitat

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority public use?**
The use is commercial haying to manage grassland habitat at Conte Refuge. Haying is a refuge management economic activity, not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

**(b) Where would the use be conducted?**
Haying would continue on up to 103 acres of grass fields within the Fort River Division of the refuge. Currently, 59 acres are commercially hayed and another 44 acres are cut by refuge staff because the

composition of these meadows has low forage value. This division includes 249 acres of mostly meadows and floodplain forest. Under the preferred alternative, the Fort River Division could expand to 2,277 acres which could include additional meadow habitat that could be hayed consistent with the ongoing program. Each of the Conservation Focus Areas (CFAs) and expanded divisions in the preferred alternative contain pasture, hay, or grassland that could be commercially hayed if its retention is called for in the Habitat Management Plan (HMP) and the vegetation is suitable forage. A map of the acreage to be hayed during a given year would be appended to the annual special use permit(s) (SUPs) which would be issued for this use.

**(c) When would the use be conducted?**
Refuge permittees would be able to access refuge hay fields from April through September 30, as needed for the haying operation. Access would be for the purposes of soil testing, application of soil amendments, planting, crop monitoring, and harvesting.

The use of a tractor to spread soil amendments and for hay harvest must occur after July 15 each year, to ensure that grassland bird species have completed nesting. Harvesting and equipment removal must be completed by September 30 each year.

**(d) How would the use be conducted?**
Individuals would be authorized to cut hay once, after July 15, via a SUP issued by the refuge manager. Currently, 71 acres of refuge grasslands are hayed every year to maintain healthy, vigorous habitat for grassland birds and other associated species. Another 44 acres (Fort River Division) (map D.2) and 11 acres (Pondicherry Division) (map D.3) are mowed by refuge staff on a 2- to 3-year rotation. The meadows at the Fort River Division are not currently suitable as forage because of a high volume of unpalatable plants. An additional 20 acres at this division are being restored to warm season grassland habitat and 30 acres of grass/forb fields are not high quality hay. These 50 acres are not included in the commercial haying program and are mowed by refuge staff. Some of these fields are left unmowed each year to provide non-breeding season habitat. The goal is to make all the grasslands at the Fort River Division (123 acres) and Pondicherry Division (11 acres) available for commercial mowing, once high quality grass forage is firmly established. Each of the other divisions and the proposed acquisitions in the CFAs contain pasture, hay, or grassland that could be mowed commercially, if acquired by the U.S. Fish and Wildlife Service (Service). The amount of haying each year would be adjusted as needed to ensure optimum maintenance of habitat for wildlife. Residual ground cover would be allowed to grow during the fall season to provide nesting habitat for waterfowl and neo-tropical migrants the next spring.

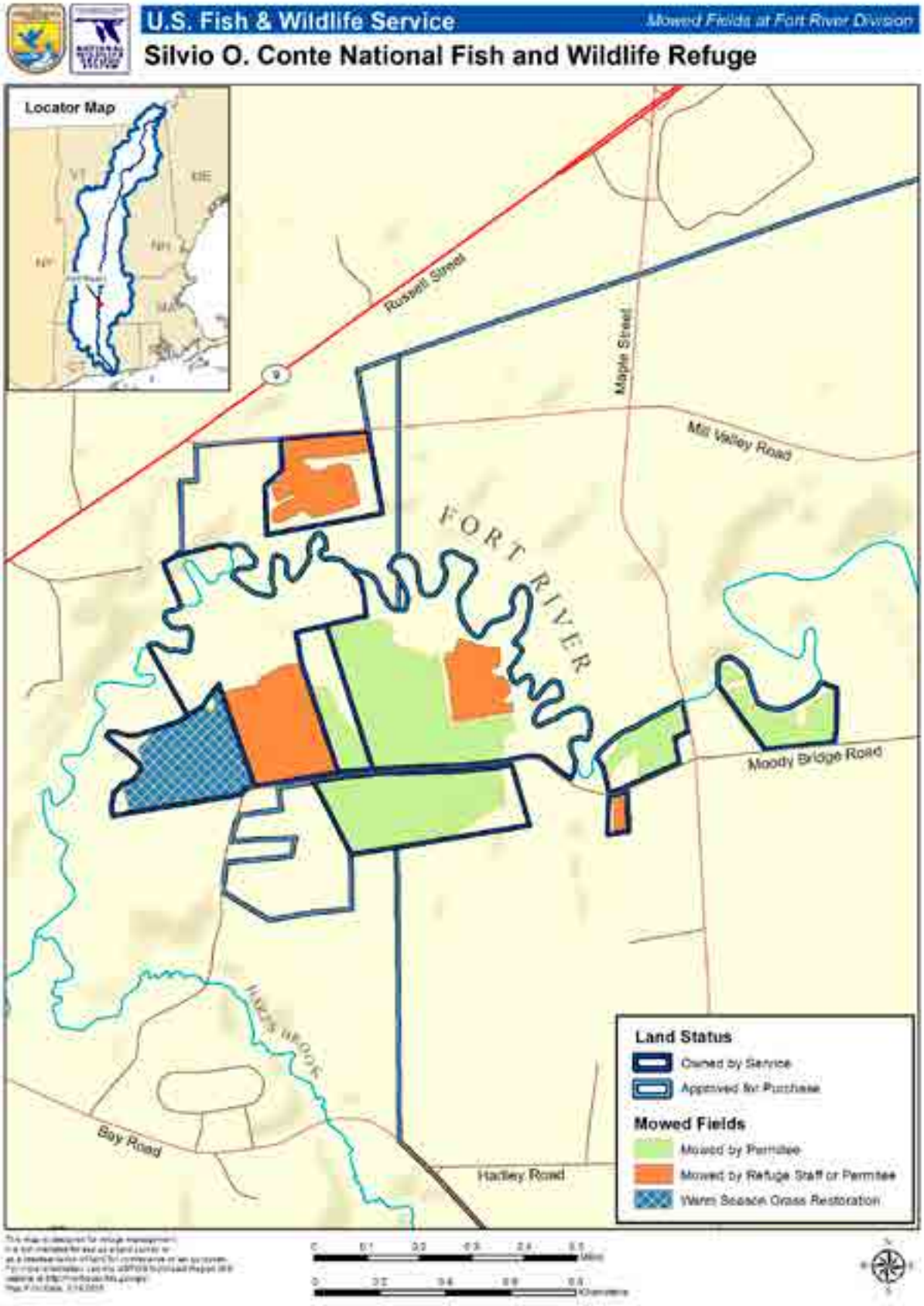
All activities under this special use permit process are regulated by provisions listed in 50 CFR (subpart D-Permits, 25.41–45). The permittee would be required to comply with all Department of the Interior, U.S. Fish and Wildlife Service, and Federal, State, and local laws in the conduct of their business. Because this is an economic use of the refuge, it is also subject to other applicable laws and regulations (see 50 CFR 29.1). We would continue to follow the procedures outlined in the Service's Refuge Manual (5 RM 17.11) and other applicable laws and regulations (see also 50 CFR 29.1) when selecting permittees and administering this use. To reduce costs of administering this use and consistency from year to year, we may follow procedures specified in this section of the Refuge Manual which allow a previous permittee to have priority over other applicants for renewal of any privilege so long as there has been compliance with the provisions of the previous special use permit.

All labor, equipment, and materials for the haying operation would be supplied by the permittee. This consists of tractors, hay wagons, soil amendments, and equipment used for spreading soil amendments. No refuge-supplied facilities or improvements are required.

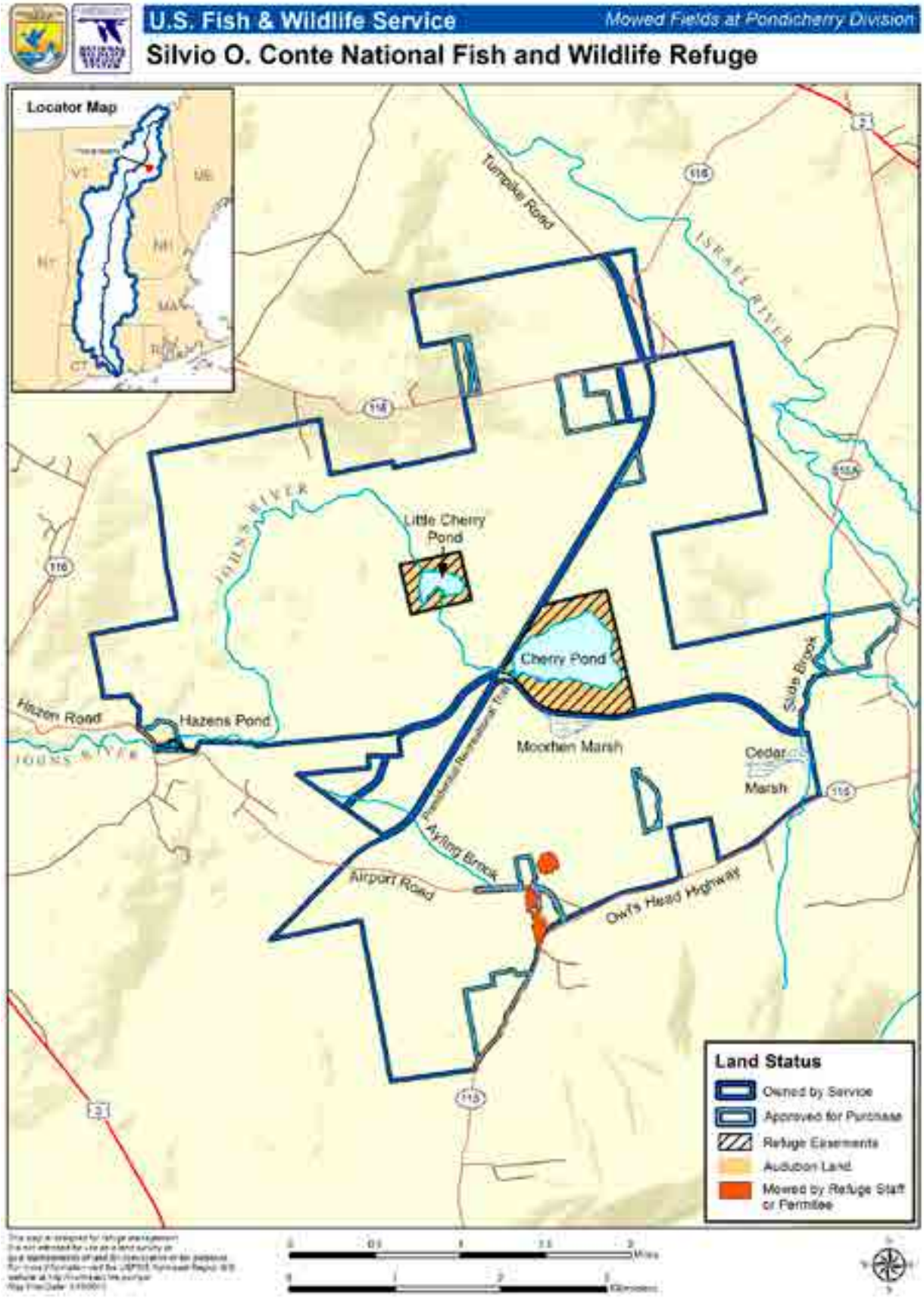
Native seed adapted to the region will be used. Overseeding is not anticipated at the Fort River Division, but should it be necessary there or elsewhere, the species would need to be approved by the refuge manager and could not contain any genetically modified materials or neonectoid treated seeds, as specified by Service policy. Permittee may access hay fields for soil testing, application of soil amendments, planting, monitoring, and hay harvesting, although several of these activities may only be permitted after July 15.

Administration of the haying program would be conducted in accordance with the forthcoming refuge HMP. Haying would be subject to the terms and conditions of an annual SUP issued by the refuge manager. The terms of this permit would ensure compatibility through application and implementation of Service policy and refuge-specific stipulations.

*Map D.2. Mowed and hayed fields at the Fort River Division of the Silvio O. Conte National Fish and Wildlife Refuge.*



*Map D.3. Mowed Fields at the Pondicherry Division of the Silvio O. Conte National Fish and Wildlife Refuge.*



**(e) Why is this use being proposed?**
In part, the Conte Refuge was established to conserve, protect, and enhance the natural diversity and abundance of plant, fish, and wildlife species and the ecosystem upon which these species depend within the refuge. Division-specific pasture/hay/grassland direction is found in the draft Comprehensive Conservation Plan (CCP), Part II Sub-objective 1.2b.

***Fort River Division:*** Sub-objective 1.2b states that the refuge will manage abandoned agricultural fields, where appropriate, to provide forest connectivity, scrub-shrub and grassland habitat for breeding grassland species (e.g., upland sandpipers), migrating landbirds, and bat species.

***Pondicherry Division:*** Sub-objective 1.2b states that the refuge will manage pasture, hay, and grasslands (where appropriate) to create a mosaic of habitat conditions required by American woodcock.

We would continue to maintain 103 acres of grassland habitat at the Fort River Division and 11 acres at the Pondicherry Division to provide nesting and migratory habitat for landbirds of high conservation priority in such as bobolinks and American woodcock (Partners in Flight [PIF] Area 27 Plan). Currently, 59 acres is commercially hayed at the Fort River Division. The remaining acres with low forage values at both divisions are mowed by refuge staff. We would strive to employ commercial cutting of pasture, hay, and grasslands wherever the vegetation is suitable for forage.

Haying and mowing are useful grassland management techniques (USFWS 1982). Mitchell et al. (2000) stated that mowing is an economical means of controlling invasion of grasslands by forbs and woody plants. Further, mowing may be a more convenient technique to apply than prescribed fire or grazing. Herkert et al. (1993) recommend rotational haying or mowing as a grassland management alternative with subunits left idle. This strategy provides a complex of grassland successional stages to meet the respective nesting requirements of several grassland bird species. More specifically, haying and mowing are recommended techniques for managing grasslands used by nesting northern harrier (Berkey et al. 1993, Dechant et al. 2001b), upland sandpiper (Kirsch and Higgins 1976, Dechant et al. 2001a), grasshopper sparrow (Dechant et al. 2001c, Vickery 1996), savannah sparrow (Swanson 2001), bobolink (Bollinger and Gavin 1992, Dechant et al. 2001d), American woodcock (U.S. Department of Agriculture, Natural Resources Conservation Service 2010), and eastern meadowlark (Lanyon 1995, Hull 2000). All of these species currently use, or were historically documented on, the Fort River and/or Pondicherry Divisions of Conte Refuge, at least during migration. These species could also be expected on the pasture, hay, and grassland habitats of additional acquisition priorities identified in the preferred alternative.

Historically most of New England was forested, except for a period following European settlement when much of the region was cleared for agriculture and subsequently grasslands and fields became abundant. In pre-settlement times, permanent, large openings were uncommon. Scattered openings occurred along large river floodplains, around beaver flowages, in coastal heathlands and in other areas of regular disturbance. Large grasslands are now in decline and the region has reforested, perhaps back to pre-settlement proportions.

Populations of grassland birds are declining as grassland habitats and other agricultural conditions diminish. Grassland birds have declined more consistently and over a wider geographic area than any other group of North American birds over the last 30 years (Robbins et al. 1986, Askins 1993, Knopf 1995, Askins 1997, Sauer et al. 1997). As a result, most grassland birds appear on lists of rare and declining species (NYSDEC 1997, Pashley et al. 2000, U.S. NABCI Committee 2000, USFWS 2002). Norment (2002) notes that despite the relatively recent (last 200 years) rise and fall of grassland habitats and associated birds in New England, the region may still be important for these species given their continental decline and habitat loss in the core of their ranges in the Midwest.

Large grasslands are declining across the Northeast as a result of forest succession and development. Many remaining fields are mowed twice a year (late spring and mid-summer) for hay, and hence, are less suitable for nesting birds. Although there is uncertainty about the extent of grassland habitat and associated wildlife prior to European settlement, grasslands provide a component of diversity that is desired (Jones and Vickery 1997).

American woodcock, which depend on old fields and clearings for courtship displays in the spring, are declining at a rate of 2 to 3 percent per year. The major causes for these declines are thought to be loss and

degradation of habitat on the breeding and wintering grounds, resulting from forest succession and land use changes (Kelley 2003). Bobolinks also rely on open field habitat for nesting and foraging and are also declining (approximately 3 percent per year) in this region.

In addition to providing breeding habitat, the fields provide important foraging habitat for spring and fall migrating birds such as the bobolink. Most migratory birds rely on seeds, fruits, and insects to sustain them through migration. While difficult to quantify, the foraging habitat provided during migration is considered a vital component of the overall habitat quality.

Grassland management requires disturbance (e.g., mowing) to prevent natural succession to shrubland and forest. Most of the grassland bird species (e.g., grasshopper, vesper, and savannah sparrows, upland sandpiper, and eastern meadowlark) that have declined in the region require 20 acres or more of contiguous grassland habitat (Jones and Vickery 1997). Only the bobolink occupies areas less than 10 acres, although a viable population would require a larger grassland area. Small grasslands surrounded by forest or shrubland and isolated from each other are unlikely to provide quality nesting and feeding habitat for these birds (Askins 1997). Without active management, refuge grasslands would succeed to shrub and forest habitat and be susceptible to nonnative invasive species including purple loosestrife, multiflora rose, reed canary grass, and Japanese knotweed.

## AVAILABLITY OF RESOURCES:

This activity is a refuge management economic activity conducted for the Service by a citizen through the use of a SUP, and therefore, is not subject to the Refuge Recreation Act.

For purposes of documentation, the costs associated with this use are minimal and include the cost of preparing a permit annually, communicating habitat management goals to the permittee annually, and monitoring the activity.

We estimate these costs associated with this use:

| | |
|---|---|
| *Law enforcement–patrol/visitor-resource protection/public use monitoring/enforcement/outreach* (GS-9 Refuge Officer): | $1,000 |
| *Resource impacts/monitoring* (GS-11 Wildlife Biologist): | $1,000 |
| **Total:** | **$2,000** |

## ANTICIPATED IMPACTS OF THE USE:

### Effects on Wildlife:

Haying on the Fort River Division of the Conte Refuge is used as an inexpensive management tool to maintain habitat for grassland-nesting birds, and for woodcock singing grounds and nocturnal roosting fields (Sepik et al. 1981) as well as providing habitat for other wildlife species such as geese, deer, and bears. At the time of refuge establishment, sedge wrens, which are a State-listed endangered species, nested on the property. Traditional habitat management activities, including haying, have been continued to ensure no significant habitat changes that could threaten use by sedge wrens. Haying has continued to make the habitat attractive to other species of importance such as bobolinks, American kestrels, and red-tailed hawks.

Haying by private parties would result in short-term disturbances and long-term benefits to both resident and migratory wildlife using the refuge. Short-term impacts would include disturbance and displacement of some wildlife by equipment operation. Haying activities would also result in short-term loss of habitat for species using those areas for nesting, feeding, or resting. This would be partially mitigated by limiting all cutting and haying until after July 15, when bobolinks, savannah sparrows, and most other grassland-nesting birds have fledged at least one brood.

Other short-term impacts would be noise and exhaust fumes generated by the tractors and associated farm equipment; however this would not be a significant impact. The resulting habitat would improve conditions for

most of the species adversely affected by the short-term negative impacts (e.g. upland sandpiper, grasshopper sparrow, savannah sparrow and bobolink).

The American woodcock requires open areas for its spring courtship. Large fields, such as those at the Fort River Division, are used by woodcock as nocturnal roosting areas during the summer months. The American woodcock is a high priority species under both the PIF and Bird Conservation Region (BCR) 30 programs.

The lush regrowth that appears after a field is hayed provides green browse for white-tailed deer and other wildlife.

## Effects on Habitat:

Machinery and people can be vectors for invasive plants when seeds or other propagules are moved from one area to another. Once established, invasive plants can outcompete native plants, thereby, altering habitats and indirectly impacting wildlife. The threat of invasive plant establishment would always be an issue requiring annual monitoring, and when necessary, treatment. However, risks of introducing invasive plants via moving haying equipment from one hay field to another are thought to be minimal because there is usually little exposed soil in the fields to get stuck in the tires. Staff would work to eradicate any invasive species and educate the visiting public and permittee on ways to identify invasive species and methods to minimize the risk of spreading invasive species.

Overall, a controlled haying program would have long-term positive impacts to the refuge's grassland habitat. Haying suppresses invasion of grasslands by perennial forbs and shrubs. Consequently, grass-dominated plant communities are maintained. Diverse grasslands provide habitat for a greater diversity and abundance of grassland birds and other wildlife.

## Effects on Water Quality:

The farmer is allowed to test the soil for fertility and add amendments. Over-fertilizing, fertilizing at the wrong time of year, or applying fertilizer too close to a water body can have negative impacts on water quality. Excess nitrogen and phosphorus, entering a body either overland or through the groundwater, can increase the nutrient levels in the water body. Fertilizer in a water body results in increased plant growth just as on the farm field, only in this case growth of phytoplankton, algae, and macrophytes. Dying plant material can take up a great deal of dissolved oxygen, leading to anoxic conditions and possibly to fish kills. To protect water quality on and around the refuge unit, we would impose the following stipulations as part of the SUP: (1) the permitee would be required to submit results of the soil test and plans for any amendment application to the refuge manager for approval prior to any application, and (2) permittee may not apply any soil amendments (fertilizers) on frozen ground or within a buffer zone of 100-feet of a water body.

## Socioeconomic Effects:

The haying program would also have positive economic impacts for the permittees, and would result in hay being available to local farmers and construction contractors.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

On refuge lands:

- Commercial haying will be done under a SUP in accordance with 5 RM 17. Permittees will be selected according to 5 RM 17.11 (A).

- Permittees must abide by the conditions and stipulations stated in the SUP. SUPs include stipulations on the timing, frequency, and pattern of haying to best meet wildlife habitat objectives each year.

- The permittee will use every feasible precaution against causing excessive surface damage to Refuge lands, roads, wetlands, and waters. Permittee will report any damages to the refuge manager as soon as possible.

- The permittee shall take all reasonable precautions to prevent the escape of fires and to suppress fires and shall render all reasonable assistance in the suppression of refuge fires.

- Permittee will not conduct activities in connection with SUPs in any such manner that would interfere with or cause hazards to Refuge staff or other parties authorized to enter the property.

- Refuge staff must continue to monitor the refuge for the presence of threatened or endangered species and ensure that haying continues to produce the desired habitat conditions which are beneficial to wildlife.

- Refuge permittees may access refuge hay fields from April through September, as needed for the haying operation for the purposes of soil testing, and crop monitoring. Tractor, machinery, and vehicle access for the application of soil amendments, planting native species, and harvesting, will take place between July 15 and April 1.

- No soil amendments (fertilizers) will be applied on frozen ground or within a buffer zone of 100 feet of a water body.

- Permitees must have written approval from the refuge manager before applying any pesticide (including herbicides). The type, timing, and application rate will be based on a Service-approved pesticide use plan obtained by the refuge manager. To provide enough time to complete the Service's pesticide use approval process, permittees would need to submit the following to the refuge manager at least 3 months prior to the desired application date:

  (1) The pesticide label containing the common name of the pesticide and application.
  (2) Recommended number of applications.
  (3) Application methods.
  (4) Target pests.

  If the pesticide use is approved, the permittee is required to complete a pesticide spray record at the time of application. The pesticide spray record would be supplied by the refuge manager

- Grass harvest must occur after July 15 each year, to ensure that grassland bird species have completed nesting. Harvesting and equipment removal must be completed by September 30, which is the ending date of the annual SUP issued for this refuge use.

- Haying locations may be adjusted annually or cancelled in any given year or series of years in the interest of optimizing habitat conditions for wildlife.

- Any seed used will be native and adapted to the region, and will not contain any genetically modified materials or neonectoid treatments.

## JUSTIFICATION:

We have determined that allowing commercial haying on Conte Refuge would not materially interfere with, or detract from, the mission of the Refuge System or the purposes for which the refuge was established. In fact, based on the analysis presented above, we have determined that allowing this use will contribute to the mission of the Refuge System and the purposes for which the refuge was established as follows. Haying contributes to the refuge's wildlife purposes by maintaining habitat in a condition suitable for use by wildlife, primarily obligate grassland nesting birds. Fields not mowed provide habitat from late summer through early spring. Raptors benefit from the area by using it extensively to hunt for small mammals. Small and large mammals use the fields for foraging and to raise their young. On some fields with low forage values mowing will be conducted by refuge staff and therefore, not be subject to a compatibility determination. However, where feasible, it is more efficient and cost effective to issue an annual special use permit to harvest hay.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Non-traditional Geocaching

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No _____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Non-traditional Geocaching

## NARRATIVE:

Non-traditional geocaching activities are not priority public uses; however, they can facilitate priority public uses on the refuge. When designed carefully, non-traditional geocaching activities can be used as a form of interpretation to educate the public about the U.S. Fish and Wildlife Service (Service), the National Wildlife Refuge System (Refuge System), and the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge). Non-traditional geocaching can also facilitate wildlife observation and photography. One of the goals of the Service and the Refuge System is to provide opportunities to view wildlife and to partake in interpretation. Allowing the use of the Silvio O. Conte National Fish and Wildlife Refuge areas that are already open to the public, such as designated roads, trails, pull-outs, overlooks, and visitor contact facilities, to persons engaging in non-traditional geocaching supports this goal.

Traditional geocaching is not appropriate on national wildlife refuges because it does not comply with Federal regulations or Service policies because it involves leaving behind objects (e.g., physical caches) and may involve digging which could disturb sensitive natural and cultural resources. Unlike traditional geocaching, in non-traditional geocaching physical caches (e.g., boxes, trinkets, etc.) are not left behind. Instead, non-traditional geocaching involves using Global Positioning System (GPS) receivers or mobile devices to navigate to certain locations to find visitor facilities, natural or cultural features of interest, wildlife-viewing hotspots, interpretive signs, etc. Visitors engaged in non-traditional geocaching would walk, hike, snowshoe, cross-country ski along refuge trails or bicycle or drive on public roadways.

All non-traditional geocaching programs on the refuge would be designed or approved by refuge staff to ensure that they support priority public uses and to minimize impacts to refuge wildlife and habitats. Non-traditional geocaching would also only be allowed in locations open to the public and the majority of use would occur along refuge trails and roads and inside refuge facilities. Therefore, non-traditional geocaching is anticipated to have the same level of impacts as those under the primary public uses, because the access and activities are very similar. Because these activities will be supervised by refuge staff, impacts of geocaching will likely be minimal when conducted in accordance with refuge regulations.

Geocaching opportunities advertised on appropriate public Web sites would build awareness of the Refuge System and would attract new visitors, many of whom would partake in wildlife dependent activities while at the refuge. Additionally, non-traditional geocaching activities would not materially interfere with or detract from the fulfillment of the Refuge System mission or the purpose for which the refuge was established, and it would encourge geocachers to stop at the visitor center to obtain refuge or wildlife viewing information.

For the reasons above, non-traditional geocaching is an appropriate use on all divisions and units of the Conte Refuge, with the exception of the Dead Man's Swamp and the Wissatinnewag Units, which are closed to the public to protect sensitive resources, and the Mount Tom Unit, which is currently closed due to public safety and vandalism concerns.

# COMPATIBILITY DETERMINATION

## USE:

Non-traditional Geocaching

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE

**(a) What is the use? Is it a priority public use?**
The use is non-traditional geocaching, including virtual geocaching, letterboxing, earthcaching, trail link.

Traditional geocaching is an outdoor activity in which the participants use a GPS receiver or mobile device or other navigational technique to find, hide, and seek containers, called “geocaches” or “caches.” A typical cache is a small, waterproof container containing a logbook where the geocacher enters the date that they found it and signs it. Larger containers such as plastic storage containers or ammunition boxes can also contain items

for trading, usually toys or trinkets of little value. Traditional geocaching is not appropriate and not compatible on national wildlife refuges because it does not comply with Federal regulations or U.S. Fish and Wildlife Service policies and guidance because it involves leaving behind objects and may involve digging which could disturb sensitive natural and cultural resources.

However, non-traditional geocaching generally does not involve leaving or removing a physical cache. Examples of non-traditional geocaching include virtual geocaching, earthcaching, Trail Link, letterboxing, and GPS Adventure. While this is not a complete list, these forms of geocaching focus on the use of a GPS or other means to locate places of interest such as a landmark, or a scenic vista rather than a hidden box with items to trade. These listed forms of non-traditional geocaching are allowable on national wildlife refuges if found appropriate and compatible. Below are more details on these types of non-traditional geocaching:

> *Virtual Geocaching* (*www.waymarking.com*) uses hand held GPS devices, but the goal of the activity is different [from traditional geocaching] and the activity can be enjoyed without placing a physical cache. Virtual caching provides GPS coordinates to existing points of interest, such as a facility, cultural feature, wayside exhibit, or object in public areas.
>
> *Letterboxing* (*www.letterboxing.org*) involves the placement of a cache containing a stamp and an inkpad that participants use to document that they have discovered a specific location. Participants find the location by following "clues" offered on the web involving map coordinates or compass bearings. We would only allow letterboxing to occur inside refuge visitor contact stations because it does involve leaving behind a stamp and inkpad.
>
> *Earthcaching* (*www.earthcache.org*) is a type of virtual geocache. The Web site lists a number of virtual caches which are educational in purpose and judged for suitability by a team supported by the Geological Society of America.
>
> *Trail Link* is a partnership between Geocaching.com and the Rails to Trails Conservancy to collect mapping data for over 15,000 miles of trails Nationwide. Members of the Rails to Trails Conservancy are encouraged to capture GPS coordinates as they hike. The GPS coordinates can be supplemented with photos and other interpretive information about particular points along the trails. For more information about the program and its possible application to Refuge System trails, *visit www.geocaching.com/railstotrails/default.aspx*.
>
> *GPS Adventures* (*http://www.gpsmaze.com/index.html*) is a program that incorporates lesson plans from a number of educational programs about geography, history, science, and technology. The program includes a GPS Adventures Maze to provide students with hands-on exploration of the use of GPS technology in support of school programs.

Non-traditional geocaching is not a priority public use. However, it can be used to facilitate priority public uses of the Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), such as interpretation, wildlife observation, and wildlife photography. This can be achieved by using the geocaching activity to lead visitors to areas of interest, to create a virtual tour that interprets different parts of the refuge, and by leading visitors into visitor centers or visitor contact centers where they can partake in other interpretation and education events. To ensure non-traditional geocaching supports priority public uses, we would only allow non-traditional geocaching opportunities on the refuge that are designed or approved by appropriate refuge staff.

**(b) Where will these uses be conducted?**

All non-traditional geocaching activities will be allowed only in areas of the refuge open to the public. All geocache routes must be approved by refuge staff prior to their use. Geocaching activities will avoid areas sensitive to disturbance (e.g. sensitive vegetation areas, sensitive breeding areas, areas with endangered, threatened, or rare animals and plans) or degradation (e.g. soil compaction), and will be designed to minimize impacts to endangered species, nesting birds, or other breeding, feeding, or resting wildlife. Certain areas of the Conte Refuge may be temporarily or seasonally closed to this use at the refuge manager's discretion to protect sensitive habitats or species of concern, minimize conflicts with other refuge activities, or due to human health and safety concerns.

**(c) When will the uses be conducted?**
Geocaching can occur throughout the year during daylight hours on all refuge division and units, with the following exceptions:

## Third Island Unit

The Third Island Unit is seasonally closed (January 1 through July 31) to protect nesting bald eagles.

## Deadmans Swamp, Wissitinnewag, and Mount Tom Units

The Deadmans Swamp and the Wissitinnewag Units are closed to the public to protect sensitive resources. Currently, the Mount Tom Unit is also currently closed due to public safety and vandalism concerns.

**(d) How will the uses be conducted?**
Non-traditional geocaching can be used as a tool to get people to visit refuge divisions and units. Interpretive materials associated with geocaching will give the general public an opportunity to learn about the refuge, the Refuge System, and the Service. Geocaching is self-regulating with cache coordinates and clues listed on appropriate organization Web sites (see Web site link above in the description of use) along with any special rules and instructions. All geocaches will be designed to keep visitors within open public areas, generally along refuge trails and roads and at other public use facilities. Some geocaches may not be available year-round depending on weather conditions, staffing, and seasonal wildlife-related closures. When geocaches are not available, this will be posted on appropriate organization Web sites to notify possible visitors. All geocaches need to be approved by appropriate refuge staff and should support priority public uses (interpretation, environmental educations, wildlife observation, photography, fishing, and hunting). All areas where geocaching will be allowed are already managed by the refuge for other wildlife dependent activities.

To partake in geocaching, visitors enter the refuge divisions and units at public entry points or drive to refuge parking areas and walk from there. Visitors may park vehicles at refuge parking areas, along the shoulders of designated refuge roads (Nulhegan Basin Division), and where legal, along public roads. Information about where to park to access a particular geocache will be listed on appropriate geocaching Web sites. Informational kiosks at the Nulhegan Basin Division and the Pondicherry Division currently explain permitted public uses. Similar parking lots and informational kiosks are planned for the entry of each refuge division and unit. Designated wildlife observation trails on the refuge are described and interpreted in the trail brochures and on the Web site. As trail connections are made, refuge brochures and kiosks will be updated to show all designated trails. Visitors may also access geocaches from small, non-motorized water craft; however, water access is difficult and limited in most of the refuge divisions and units; so, this is not expected to be a major source for geocaching.

Geocaching can occur on an individual or group basis. To accommodate other users and promote a positive wildlife observation experience, we encourage smaller group sizes (less than 10 members).

**(e) Why are these uses being proposed?**
Geocaching activities are not priority public uses; however, they facilitate priority public uses on the refuge. When designed carefully, geocaching activities can be used as a form of interpretation to educate the public about refuge management challenges and goals, refuge missions, and about priority public uses. Through geocaching, visitors will have the opportunity to observe and learn about wildlife and wild lands at their own pace in both structured and unstructured environments, and to observe wildlife in their natural habitats firsthand. Likewise, geocaching provides visitors with opportunities to enjoy refuge resources and to gain a better understanding and appreciation of fish and wildlife, wild lands ecology, the relationships of plant and animal populations in an ecosystem, and wildlife management. These activities will enhance public understanding of natural resource management programs and ecological concepts, enable the public to better understand the problems facing our wildlife and wild lands resources, help visitors to better understand how they affect wildlife and other natural resources, and learn about the Service's role in conservation and restoration.

Geocaching opportunities advertised on appropriate public Web sites would build awareness of the Refuge System and would attract new visitors, many of whom would partake in wildlife dependent activities while at the refuge. Additionally, people partaking in geocaching would be encouraged to stop at refuge informational

kiosks and visitor centers/contact stations to obtain refuge or wildlife viewing information, or to partake in a wildlife dependent activity.

## AVAILABILITY OF RESOURCES

The following list estimates the required costs for the refuge to administer and manage geocaching as a form of interpretation. They do not include the costs of new construction, kiosks, signs and other costs associated with the Comprehensive Conservation Plan (CCP). They also do not cover unanticipated costs such as participation in search and rescue operations. The refuge officer is the primary contact for any emergency operations on the refuge, however local resources are available to assist and provide significant resources if necessary. Because such an incident is uncommon and unpredictable, these costs are not assumed in the resources estimate below.

| Costs | |
|---|---|
| *Program Oversight* (wildlife refuge manager and visitor services manager): | $2,000 |
| *Monitoring Resource Impacts* (wildlife biologist): | $1,800 |
| *Materials* | $500 |
| **Total annual recurring costs:** | **$4,300** |

The financial and staff resources necessary to provide and administer these uses at their current levels are now available. We expect the resources to continue in the future, subject to availability of appropriated funds.

## ANTICIPATED IMPACTS OF THE USE

The proposed use is anticipated to have the same level of impacts as those under the primary public uses, because the access and activities are very similar. Because these activities will be supervised by refuge staff, impacts of geocaching will likely be minimal if conducted in accordance with refuge regulations.

Following are descriptions of potential adverse effects on natural resources from geocaching accessed by walking, hiking, and non-motorized boating in authorized areas within the refuge.

In general, we expect impacts to refuge resources to be negligible or minor because the projected level of use is low, geocache courses must be approved by refuge staff, and the use will occur in areas of the refuge already open to public use. We will consider each proposed geocache course for its potential to impact refuge resources, and will not approve any that we feel will lead to adverse impacts to soils, wildlife, vegetation, water quality, or hydrology. For example, we would not approve a geocache course or site that would encourage visitors to walk through sensitive wetlands or through important breeding habitat. If, after approved, a particular geocache course causes any issues or negative impacts on refuge resources, we will relocate or discontinue that geocache course.

**Effects on Hydrology and Water Quality:** Visitor use has the potential to contaminate lakes, ponds, streams and the major tributaries of the Connecticut River. Exposed soils on hiking trails may increase sediments in near-by waterways, and petroleum products may be introduced by run-off from parking lots. However, overall we do not anticipate any major impacts to hydrology and water quality because these uses are limited to designated areas only, current and projected levels of use are relatively low, and we will build, maintain, and monitor trails and roads in such as ways as to minimize impacts.

Non-traditional geocaching will generally occur on or along designated roads, trails, pull-outs, overlooks, and visitor contact facilities that are on Service-owned areas. Buffers will be required on trails that are adjacent to waterways to decrease bank erosion, and filter contaminants before they enter waterbodies. Boardwalks will provide a path for users to cross over the wetlands or streams and not through them, thereby minimizing long-term adverse effects to hydrology and water quality. In addition, refuge staff will routinely monitor roads, trails, and boardwalks for damage and remediate problem areas as needed. Although some off-trail use may occur, the majority of users stay on trails and roads. Off-trail use would be dispersed and occur at low levels.

Boating will occur, both motorized and non-motorized forms on refuge waterbodies. The most likely locations for motor boating are Lewis Pond at the Nulhegan Basin Division and McConnell Pond, which is proposed for addition to this division. The use of motorboats is currently estimated at one to two boats per week. This low level of use is expected to continue into the future and is expected to have only minimal impacts to

water quality. Boat speeds are not to exceed 5 miles per hour, so boat wakes and the associated erosion is not anticipated.

Refuge parking lots will not be located directly adjacent to streams, rivers, or other wetlands. Additionally, where feasible, parking lots will be constructed of gravel, which is more porous than impervious surfaces such as asphalt, and therefore would result in lower levels of runoff and sedimentation.

**Effects on Vegetation**: To facilitate geocaching, we will allow hiking, cross-country skiing, and snowshoeing access on areas open to the public and bicycle and automobile access on designated roads. Short-term effects consist of the deterioration of plant material, whereas long-term effects of trampling include direct and indirect effects on vegetation and soils like diminishing soil porosity, aeration, and nutrient availability through soil compaction (Kuss 1986, Roovers et al. 2004). Compaction of soils thus limits the ability of plants, particularly rare and sensitive species, to revegetate affected areas (Hammitt and Cole 1998). Kuss (1986) found that plant species adapted to wet or moist habitats are the most sensitive and increased moisture content reduces the ability of the soil to support recreational traffic. Where adverse impacts to vegetation are observed, the refuge will take necessary measures, such as remediation and trail closures, to restore plant communities.

It is anticipated that allowing foot traffic will cause some vegetation loss, increased tree root exposure and trampling effects, however we will minimize the potential for impacts to vegetation by encouraging users to stay on designated trails and roads including former logging roads with hardened surfaces and existing trails that have been used for many years. Although some off-trail use may occur, the majority of users stay on trails and roads. Off-trail use would be dispersed and occur at low levels.

Unmanaged non-traditional geocaching has the potential to damage or kill plants adjacent to designated trails and can lead to new unwanted "impromptu" trails on the refuge that become "short-cuts" through more ecologically sensitive sites. Heavy use of designated, managed, or unmanaged pedestrian travel routes can ultimately lead to areas void of vegetation (McDonnell 1981, Vaske et al 1992). We will encourage users to remain on existing trails and roads through signage and refuge brochures. It is also anticipated that under current and projected use the incidence of these problems will be minor. Some rare plants have been documented in habitat adjacent to trails; however, designated routes do not have any known occurrences of rare plant species on their surface or soils subject to compaction that will be impacted by this use. Because cross-country skiing and snowshoeing only occur during the winter, when plants are dormant and the ground is covered with snow, we anticipate negligible impacts to vegetation from cross-country skiing and snowshoeing. We will not allow bicycles or automobiles off of refuge roads. Refuge staff will monitor all trails, identify problem areas, and conduct appropriate restoration and protection efforts.

People can be vectors for invasive plants when seeds or other propagules are moved from one area to another. The threat of invasive plant establishment would always be an issue requiring annual monitoring, and when necessary, treatment. Staff would work to educate the visiting public to reduce introductions and would also monitor and control invasive species.

**Effects on Soils**: Soils can be compacted and eroded as a result of continued use of pedestrian routes (Cole and Landres 1995). It is anticipated that some soil compaction, erosion, and sedimentation would occur as a result of continuing pedestrian access. Geocaching is not expected to substantially increase trail use beyond what would be seen by the four priority public uses of environmental education, interpretation, wildlife observation, and wildlife photography. The majority of visitors stay on trails and roads. To protect sensitive resources, we may close areas of the refuge seasonally or permanently to minimize impacts.

**Effects on Wildlife**: Short-term and long-term adverse impacts will be expected for wildlife populations in relation to increasing trail miles and visitor use. However, we do not anticipate any major, long-term impacts on wildlife from allowing these uses because current and projected levels of use are relatively low and these uses are only allowed in designated areas, such as trails and roads.

Disturbances to wildlife will vary by wildlife species involved and the type, level, frequency, duration, and the time of year activities occur. Beale and Monaghan (2004) found that adverse effects to wildlife increase as number of users increase. The study found that an animal's response to one visitor walking down a trail is entirely different than its response to a group of users walking down a trail. The refuge recognizes that large group sizes may amplify negative effects to wildlife. Therefore, groups larger than 10 are required to notify the refuge prior to visiting to determine if a special use permit (SUP) would be needed. This will enable the

refuge to understand which trails are preferred by large groups, and to monitor any potential excessive wildlife disturbance created by large groups. Having the ability to monitor these kinds of disturbances will also enable the refuge to mitigate impacts associated with large groups. Examples of mitigation may include directing large groups to less sensitive habitats during breeding seasons or assigning refuge staff to lead or meet with the group while on refuge lands.

Other responses of wildlife to human activities includes: avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993, Whittaker and Knight 1998), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior or habituation to human disturbance (Burger 1981, Korschen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), attraction (Whittaker and Knight 1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Knight and Cole (1991) suggest recreational activities occurring simultaneously may have a combined negative impact on wildlife. Hammitt and Cole (1998) concluded that the frequent presence of humans in wildland areas can dramatically change the normal behavior of wildlife mostly through "unintentional harassment." These responses can have negative impacts to wildlife such as mammals becoming habituated to humans making them more susceptible to hunting mortality. Human induced avoidance by wildlife can prevent animals from using otherwise suitable habitat. Seasonal sensitivities can compound the effect of disturbance on wildlife. Both bird and mammal species which are present and active during the winter have the added environmental stressors of severe weather and food shortages, and can be more negatively affected than they would from the same level of disturbance during the warmer seasons (Hammit and Cole 1998). However, many migratory birds are not present in the winter, and most resident species are not breeding or raising young during the time of year when cross-country skiing and snowshoeing occur. Additionally, many mammal species are less active during winter months

Disturbance can cause shifts in habitat use, abandonment of habitat and increased energy demands on affected wildlife (Knight and Cole 1991). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. In this study, common species (e.g., American Robins) were found near trails and rare species (e.g., blackburnian warblers) were found farther from trails. In some cases there is a clear link between the extent of disturbance and either the survival or reproductive success of individuals (e.g., Schulz and Stock 1993), but in many cases disturbance act in a more subtle way, by reducing access to resources such as food supplies or nesting sites (Gill et al. 1996). Bird flight in response to disturbance can lower reproductive success by exposing individuals and nests to predators. For recreation activities that occur simultaneously (hiking, biking, and horseback riding) there will likely be compounding negative impacts to wildlife (Knight and Cole 1991).

Evidence suggests that species most likely to be adversely affected are those where available habitat is limited thus constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 2001). This is especially true for federally listed species, as well as other species that are sensitive to human disturbance with specialized habitat requirements, such as bald eagle, peregrine falcon, and American black duck (DeGraff et al. 2001, Longcore et al. 2000). We will not allow geocaching where any federally listed species occurs. Also, limiting or closing recreational use within the vicinity of nest sites during the breeding season will mitigate impacts to other sensitive and rare species. For example, the Third Island Unit of the refuge is closed to these uses to protect bald eagles during the sensitive breeding season. Additionally, trail development has striven and will continue to avoid sensitive habitats.

Wildlife disturbance may be compounded by seasonal needs. For example, causing mammals to flee during winter months would consume stored fat reserves that are necessary to get through the winter. Hammitt and Cole (1998) found white-tailed deer females with young are more likely to flee from disturbance than those without young. Some species, like warblers, would be negatively affected by disturbance associated with bird watching particularly during the breeding season.

For songbirds, Gutzwiller et al. (1994) found that low levels of human intrusion altered the singing behavior of some species. Disturbance may also affect the reproductive fitness of males by hampering territory defense, mate selection, and other reproductive functions of vocalizations (Arrese 1987). Disturbance, which leads to reduced singing activity, makes males rely more heavily on physical deterrents, which are time- and energy-consuming in defending territories (Ewald and Carpenter 1978).

Short-term localized adverse impacts to fish populations may result from refuge construction and restoration projects that might cause soil erosion and sedimentation into refuge waterways. Long-term adverse impacts from increased trail miles and trail use might pose another concern to refuge fisheries. Trails that have stream and river crossings will likely degrade over time with increased use and contribute to downstream sedimentation and turbidity, which has been found to be a stressor to brook trout (Sweka and Hartman 2001) and redside dace (Holm and Crossman 1986) populations that are sensitive to habitat degradation. Buffers will be required for trails located along riparian areas to decrease erosion of river banks, and filter contaminants before they enter waterways. The refuge will monitor stream and river crossings closely and remediate any damaged areas to minimize adverse impacts associated with trail use.

Refuge visitors who choose to boat may cause localized, minor, short-term impacts by disturbing the bottom substrate in shallow water. In addition, discarded items such as plastic containers present a risk for waterfowl and other birds.

We will take all necessary measures to minimize all of these impacts, particularly where geocaches are involved. We will evaluate the sites and programs periodically to assess whether they are meeting the objectives, and to prevent site degradation. If evidence of unacceptable adverse impacts appears, we will rotate the activities to secondary sites, or curtail or discontinue them. We will close areas seasonally around active bird nesting sites and avoid recreational use of areas where federally listed species occur to minimize or eliminate human disturbance. We will post and enforce refuge regulations, and establish, post, and enforce closed areas.

## PUBLIC REVIEW AND COMMENT

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- No geocache shall be created or posted on public Web sites without the permission of appropriate refuge staff.
- Geocaches shall be created only in areas open to the public.
- All individuals partaking in geocaching must adhere to area closures and understand that certain geocaches may not be available year-round.
- Appropriate notification must be listed on public Web sites when a geocache is not available as a result of area closures.
- No physical item shall be placed or left on the refuge.
- Letterboxing would only be allowed within visitor contact stations or visitor centers.

- Appropriate notification about the availability of letterboxes based on staffing and visitor contact station open hours will be posted on all public Web sites.

- Refuge regulations will be posted and enforced. Closed areas will be established as needed, posted, and enforced. Signs necessary for visitor information, safety, and traffic control will be kept up to date.

- The known presence of a threatened or endangered species will preclude any new use of an area until the refuge manager determines otherwise.

- Locations for geocaching will be chosen to minimize impacts to wildlife and habitat. We will periodically evaluate sites and programs to assess whether objectives are being met and to prevent site degradation. If evidence of unacceptable adverse impacts appears, the location(s) of activities will be rotated with secondary sites, curtailed, or discontinued.

- Walking, hiking, and boating to facilitate geocaching is only compatible in designated areas of the refuge open to the public.

- Walking and hiking are restricted to refuge open hours: one-half hour before sunrise until one-half after sunset (except the Nulhegan Basin Division, which is open 24 hours a day, 7 days a week).

- Boat launching and retrieval from refuge lands are restricted to refuge open hours.

- Camping and overnight parking are currently prohibited.

- Group size is encouraged to be no more than 10 persons to promote public safety, accommodate other users, and reduce wildlife disturbance. Groups larger than 10 persons must contact the refuge office prior to visiting the trail system so the refuge can determine if the group will require a SUP. Groups traveling only on roads shared with vehicles are not required to contact the refuge office or obtain a SUP.

- All routes designated for public access are annually inspected for maintenance needs. Prompt action is taken to correct any conditions that risk public safety. Roads and trails are maintained at a level that reasonably accounts for safe travel. Roads are not plowed in winter.

- Guidelines to ensure the safety of all participants will be issued in writing to any SUP holder for the activities and will be reviewed before the activity begins.

- Routes designated for public access are monitored periodically to determine if they continue to meet the compatibility criteria established by the refuge. Should monitoring and evaluation of the use(s) indicate that the compatibility criteria are or will be exceeded, appropriate action will be taken to ensure continued compatibility, including modifying or discontinuing the use.

- Routine law enforcement patrols are conducted throughout the year. The patrols promote education and compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interaction.

- Potential conflicts with other public uses such as hunting will be minimized by using trailhead signs and other media to inform the visitors about current public use activities as well as which activities are authorized in specific locations throughout the refuge.

## JUSTIFICATION

The Service and the Refuge System maintain the goal of providing opportunities to view wildlife and to partake in interpretation and wildlife observation and photography. Allowing the use of refuge areas that are already open to the public to persons engaging in non-traditional geocaching supports this goal. Non-traditional geocaching would provide visitors the chance to view wildlife and partake interpretation about the refuge; hence, promoting public appreciation of the conservation of wildlife and habitats. Non-traditional geocaching activities are not priority public uses; however they facilitate priority public uses on the refuge, and in some cases can be used as a form of interpretation which is a priority public use. In general, we expect impacts to refuge resources to be negligible or minor because the projected level of use is low, geocache courses must be approved by refuge staff, and the use will occur in areas of the refuge already open to public use and the use will occur at low levels. We will consider each proposed geocache course for its potential to impact refuge resources, and will not approve any that we feel will lead to adverse impacts to soils, wildlife, vegetation, water quality, or hydrology. If, after approved, a particular geocache course causes any issues or negative impacts on refuge resources, we will relocate or discontinue that geocache course. For these reasons, we believe that non-traditional geocaching activities would not materially interfere with or detract from the fulfillment of the Refuge System mission or the refuge's purposes.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE:

_____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Pet Walking

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Pet Walking

## NARRATIVE:

Individuals walking, hiking, snowshoeing, and cross-country skiing at the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge) have been accompanied by their pets (domestic canine and feline) for many years. Because domestic animals can disturb wildlife and generate conflicts with other refuge visitors, pet owners will be required to leash their pets (10-foot or shorter leash) at all times. Limiting pet walking to only those areas open to the public would also minimize potential disturbance to wildlife. The majority of pet walking occurs on refuge trails and roads. No adverse impacts have been observed in the past and current levels of this use are low and are not expected to increase substantially. Continuing to allow this use would provide the public with additional options for enjoying the great outdoors and possibly introduce new people to the refuge and the priority use of wildlife observation. For these reasons, we have determined that allowing pet walking on the refuge is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILITY DETERMINATION

## USE:

Pet Walking

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority public use?**
The use is walking leashed pets on refuge trails and in other designated areas. Pet walking is not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

**(b) Where would the use be conducted?**
On-leash pet walking would be permitted on all designated roads, trails, pull-outs, and overlooks, and in other designated areas open to the public. By encouraging visitors with pets to stay on refuge trails and roads, we will minimize impacts to sensitive areas prone to disturbance (e.g., sensitive vegetation areas) or degradation (e.g., soil compaction) and would minimize impacts to threatened and endangered species, nesting birds or other breeding, feeding, or resting wildlife. Certain areas of the refuge may be permanently or seasonally closed to public access at the refuge manager's discretion to protect sensitive habitats or species of concern, minimize conflicts with other refuge activities, or due to human health and safety concerns.

**(c) When would the use be conducted?**
All pet walking activities will occur during regular refuge hours, which are generally one-half hour before sunrise to one-half hour after sunset, with the following exceptions:

## Nulhegan Basin Division

The Nulhegan Basin Division is open 24 hours a day, 7 days a week. However, roads are closed to vehicular access during winter and the spring "mud" season, generally re-opening prior to the Memorial Day weekend.

## Third Island Unit

The Third Island Unit is seasonally closed (January 1 through July 31) to protect nesting bald eagles.

## Dead Man's Swamp, Wissitinnewag, and Mount Tom Units

The Dead Man's Swamp and the Wissitinnewag Units are closed to the public to protect sensitive resources. Currently, the Mount Tom Unit is closed to the public due to public safety and vandalism concerns.

**(d) How would the use be conducted?**
Refuge visitors are only allowed to walk their pet on the refuge if it is attached to a 10-foot (or shorter) leash and the pet walker is in control of the leash and pet at all times. The leash requirement will help minimize disturbance to wildlife, limit conflicts with other visitors, and ensure public safety. All pet walkers with properly leashed pets would be restricted to designated roads, trails, pull-outs, and overlooks, and in other areas open to the public.

**(e) Why is the use being proposed?**
Pet walking is an ongoing use on many of the refuge divisions and units, and has been occurring without any evidence that it is disruptive or causing any damage. It has been a long-time tradition for residents of the local community to use these portions of the refuge for this activity building strong local support and allowing an excellent opportunity to educate pet walkers about the refuge and the Refuge System.

## AVAILABLITY OF RESOURCES:

Except for maintaining and periodically updating existing signs explaining the regulations, minimal costs would be involved. Monitoring of the site for compliance would continue, but would not require significantly more resources beyond those already necessary to patrol the area for compliance with current regulations. Compliance with the leash regulation is within the regular duties of the refuge's federal wildlife officer. The financial and staff resources necessary to provide and administer this use at its current level and at the level described in the final comprehensive conservation plan (CCP) are now available and we expect them to be available in the future. The annualized cost associated with the administration of pedestrian travel on the refuge is estimated below:

| | |
|---|---|
| *Providing information to the public and administration needs* | $1,000 |
| *Resource impacts and monitoring* | $800 |
| **Total:** | **$1,800** |

Based on a review of the budget allocated for management of this activity, funding is adequate to ensure compatibility, and to administer and manage the use listed. Our existing staff and budget have provided sufficient resources to manage this use historically.

## ANTICIPATED IMPACTS OF THE USE:

**Effects on Hydrology and Water Quality:** Visitor use has the potential to contaminate lakes, ponds, streams and the major tributaries of the Connecticut River. Exposed soils on hiking trails may increase sediments in nearby waterways, and petroleum products may be introduced by run-off from parking lots. Contaminants from pet waste may runoff into waterways if not properly picked up and disposed of. However, overall, we do not anticipate any major impacts to hydrology and water quality because these uses are limited to designated areas only, current and projected levels of use are relatively low, and we will build, maintain, and monitor trails and roads in a manner to minimize impacts.

Pet walking will generally occur on designated trails and roads. Although some pet walking will occur off trail, visitors are encouraged to stay on refuge trails (where they exist) and the majority of pet walking occurs on trails and roads. Buffers will be required on trails that are adjacent to waterways to decrease bank erosion, and filter contaminants before they enter waterbodies. Boardwalks will provide a path for users to cross over the wetlands or streams and not through them, thereby minimizing long-term adverse effects to hydrology and water quality. In addition, refuge staff will routinely monitor roads, trails, and boardwalks for damage and remediate problem areas as needed.

Refuge parking lots will not be located directly adjacent to streams, rivers, or other wetlands. Additionally, where feasible, parking lots will be constructed of gravel, which is more porous than impervious surfaces such as asphalt, and therefore would result in lower levels of runoff and sedimentation.

**Effects on Vegetation**: People engaged in pet walking generally hike, cross-country ski, and snowshoeing along designed trails and roads. Short-term effects consist of the deterioration of plant material, whereas long-term effects of trampling include direct and indirect effects on vegetation and soils like diminishing soil porosity, aeration, and nutrient availability through soil compaction (Kuss 1986, Roovers et al. 2004). Compaction of soils thus limits the ability of plants, particularly rare and sensitive species, to revegetate affected areas (Hammitt and Cole 1998). Kuss (1986) found that plant species adapted to wet or moist habitats are the most sensitive and increased moisture content reduces the ability of the soil to support recreational traffic. Where adverse impacts to vegetation are observed, the refuge will take necessary measures, such as remediation and trail closures, to restore plant communities.

It is anticipated that allowing foot traffic on designated routes will cause some vegetation loss, increased tree root exposure and trampling effects, however we will minimize the potential for impacts to vegetation by encouraging visitors to stay on designated trails and roads, including former logging roads with hardened surfaces and existing trails that have been used for many years.

Heavy use of designated, managed, or unmanaged pedestrian travel routes can ultimately lead to areas devoid of vegetation (McDonnell 1981). However, current and projected levels of visitor use on the refuge are low. We will also encourage users to remain on existing trails and roads through signage and refuge brochures to minimize impacts to vegetation. Although some off-trail use will occur, it will be dispersed and occur at low levels. It is anticipated that under current and projected use the incidence of these problems will be minor. Some rare plants have been documented on the refuge; however, designated routes do not have any known occurrences of rare plant species on their surface or soils subject to compaction that will be impacted by this use. If necessary, we will close portions of the refuge seasonally or permanently to protect sensitive species and habitats. Because cross-country skiing and snowshoeing only occur during the winter, when plants are dormant and the ground is covered with snow, we anticipate negligible impacts to vegetation from cross-country skiing and snowshoeing. We will not allow bicycles or automobiles off of refuge roads. Refuge staff will monitor all trails, identify problem areas, and conduct appropriate restoration and protection efforts.

People and pets can be vectors for invasive plants when seeds or other propagules are moved from one area to another. The threat of invasive plant establishment would always be an issue requiring annual monitoring, and when necessary, treatment. Staff would work to educate the visiting public to reduce introductions and would also monitor and control invasive species.

**Effects on Soils**: Soils can be compacted and eroded as a result of continued use of pedestrian routes (Cole and Landres 1995). It is anticipated that some soil compaction, erosion, and sedimentation would occur as a result of continuing to allow pedestrian access. Pet walking is not expected to substantially increase use beyond what would be seen by the four priority public uses of environmental education, interpretation, wildlife observation, and wildlife photography. Further, we will minimize these impacts by only allowing pet walking in areas open to the public and if necessary, close portions of the refuge to use to avoiding wetlands and other sensitive habitats.

**Effects on Wildlife:** The presence of dogs, or other pets, may flush incubating birds from nests (Yalden and Yalden 1990), disrupt breeding displays (Baydack 1986), disrupt foraging activity in shorebirds (Hoopes 1993), and disturb roosting activity in ducks (Keller 1991). Many of these authors indicated that people with dogs on a leash provoked more disturbance than people walking without a dog, and loose dogs provoked the most pronounced disturbance reactions from their study animals. The greatest stress reaction results from unanticipated disturbance. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielson and Smith 1995). Despite thousands of years of domestication, dogs still maintain instincts to hunt and chase. The appropriate stimulus can trigger those instincts. Dogs that are unleashed or not under the control of their owners may disturb or threaten the lives of some wildlife. In effect, off-leash dogs increase the radius of human recreational influence or disturbance beyond what it would be in the absence of a dog. To minimize these impacts we require that pets must be on leash at all times.

Constant human and pet disturbance can cause shifts in habitat use, abandonment of habitat and increased energy demands on affected wildlife (Knight and Cole 1991). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. In this study, common species (e.g., American robins) were found near trails and rare species (e.g., Blackburnian warblers) were found farther from trails. In some cases there is a clear link between the extent of disturbance and either the survival or reproductive success of individuals (e.g., Schulz and Stock 1993), but in many cases disturbance acts in a more subtle way, by reducing access to resources such as food supplies or nesting sites (Gill et al. 1996). Bird flight in response to disturbance can lower reproductive success by exposing individuals and nests to predators. For recreation activities that occur simultaneously (hiking, biking, and horseback riding) there will likely be compounding negative impacts to wildlife (Knight and Cole 1991).

Evidence suggests that species most likely to be adversely affected are those where available habitat is limited, thus constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 1996). This is especially true for federally listed species. This use will not occur where any federally listed species occur. Other species that are sensitive to human disturbance with specialized habitat requirements include bald eagle, peregrine falcon, and American black duck (DeGraff et al. 2001, Longcore et al. 2000). Limiting or closing recreational use within the vicinity of nest sites during the breeding season will mitigate impacts to these species. For example, we do not permit use at the refuge's Dead Man's Swamp unit to protect the federally listed puritan tiger beetle and seasonally close the Third Island Unit to limit disturbance to breeding and nesting bald eagles. Where necessary, we will close portions of the refuge to protect listed, rare, or sensitive wildlife. Additionally, trail development has and will continue to avoid sensitive habitats.

Wildlife disturbance may be compounded by seasonal needs. For example, causing mammals to flee during winter months would consume stored fat reserves that are necessary to get through the winter. Hammitt and Cole (1998) found white-tailed deer females with young are more likely to flee from disturbance than those without young. Some species, like warblers, would be negatively affected by disturbance associated with bird watching particularly during the breeding season.

For songbirds, Gutzwiller et al. (1994) found that low levels of human intrusion altered the singing behavior of some species. Disturbance may also affect the reproductive fitness of males by hampering territory defense, mate selection, and other reproductive functions of vocalizations (Arrese 1987). Disturbance, which leads to reduced singing activity, makes males rely more heavily on physical deterrents, which are time- and energy-consuming in defending territories (Ewald and Carpenter 1978).

The role of dogs and other pets in wildlife diseases is poorly understood. However, dogs can host endo- and ectoparasites, and can contract diseases from or transmit diseases to wild animals. In addition, pet waste is

known to transmit diseases that may threaten the health of some wildlife and other domesticated animals. Domestic pets potentially can introduce various diseases and transport parasites into wildlife habitats (Sime 1999). To minimize the potential for disease transmission, we require that pets leashed at all times and that pet walkers remove pet wastes from the refuge.

Because the visitor use is light and pet walking would be restricted to areas open to the public where disturbance may already occur due to other public use activities, the potential impacts to wildlife and their habitats are expected to be minimal. In addition, the requirement for dogs to be kept on a 10-foot leash will minimize the impacts to other users and wildlife.

**Impacts to Other Visitor Uses:** User conflicts are unlikely because this use occurs at low levels on the refuge and pets would be on-leash and so prevented from disturbing and annoying others. The presence of people and pets may scare away wildlife; thus, has the potential to disturb wildlife observers and wildlife photographers. However, these uses will likely occur in more remote areas of the refuge away from heavily used trails. Pet waste is unsightly and may carry pathogens, but these impacts may be minimized by requiring pet walkers to pick-up their pet's waste.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Only leashed pets would be allowed on the refuge. The leash must be no more than 10 feet long. Pet walkers would be required to maintain control of their animal while on the refuge, thereby reducing the potential and severity of impacts to wildlife and must refrain from entering closed areas.
- Pet walking is allowed only during refuge open hours (generally one-half hour before sunrise until one-half hour after sunset).
- All individuals partaking in pet walking must adhere to area closures and understand that certain areas of refuge divisions and units may not be available year-round.
- Pet walking will only occur on designated roads, trails, pull-outs, and overlooks, and in other designated areas open to the public in order to reduce the potential disturbance of wildlife. Areas of the refuge may be closed seasonally or permanently to this use to minimize disturbance to wildlife and sensitive habitats and/or reduce conflicts between user groups.
- Pet walkers must pick up after their pet(s) and remove or properly dispose of pet waste off the refuge.
- Agency and public awareness would be increased through interpretive or educational materials about responsible pet ownership in the context of wildlife disturbance during all outdoor recreational pursuits.
- If a high number of reports of negative pet-wildlife or pet-people interactions on the refuge trails are reported, the refuge would reassess the use.
- If a high number of off-leash incidents are documented, we may consider eliminating pet walking from the refuge.

## JUSTIFICATION:

Although pets can increase disturbance to wildlife, the refuge will strictly enforce a leash requirement to keep pet and disturbances localized with the pedestrian. This is an existing use at the refuge, with no history of significant negative impacts. There are no documented incidents of domestic pet-wildlife disturbances or of pet-human conflicts. The majority of pet walkers are local residents who regularly visit the refuge for wildlife-dependent recreation and who understand our policies. The Service and the Refuge System maintain goals of providing opportunities to view wildlife. Allowing pet walking on the refuge may facilitate wildlife observation. These users may take the time to learn more about the refuge and become, or already be, supporters of the Refuge System.

Because this use is restricted to designated roads, trails, pull-outs, and overlooks, and other designated areas open to the public, away from sensitive wetland habitats and wildlife, and the current levels of the use are low, we anticipate that this use would have only negligible, minor, and temporary impacts on refuge resources. Because of this, it is consistent with the wildlife and habitat aspects of the refuge's purposes, the Service policy on compatible uses, the Refuge System Improvement Act of 1997, and the broad management objectives of the Refuge System. Pet walking would not harm threatened and endangered species because of the leash requirement and because pets will be restricted from defined endangered species areas. Therefore, no significant adverse effects from pet walking are anticipated and this activity would not materially interfere with or detract from the mission of the Refuge System.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Privately Owned Recreational Cabins at the Nulhegan Basin Division

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✔ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___✔___ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** ___✔___

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Privately Owned Recreational Cabins at the Nulhegan Basin Division

## NARRATIVE:

Fifty-nine privately owned recreational cabins existed on the Nulhegan Basin Division at the time of U.S. Fish and Wildlife Service (Service) acquisition, of which 30 currently remain. Additionally, the McConnell Pond tract, proposed for acquisition in the preferred alternative, contains an additional eight cabins. These cabins have occupied leased land from Champion International Corporation and The Conservation Fund, and their predecessors for many decades. These are managed under a SUP which includes an annual fee. The current permits will not be extended beyond 2049, the 50-year sunset date. We anticipate enacting a similar sunset date for any cabins acquired with the McConnell Pond tract. Provided funding is available, we also offer to purchase cabins at the owners' discretion. Continuing to allow this use is consistent with the Service's policy on the appropriateness of refuge uses (603 FW 1) because this use has little impact on refuge management activities, wildlife, or wildlife habitat given that this use has been occurring for upwards of 50 years.

# COMPATIBILITY DETERMINATION

## USE:

Privately Owned Recreational Cabins at the Nulhegan Basin Division

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is it a priority public use?**
The use is the occupancy and use of privately owned recreational cabins (camps), which are located on refuge lands. It is not a priority public use of the National Wildlife Refuge System (Refuge System), under the

National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997.

Recreational use of camps on timber company lands in the Nulhegan Basin originated in the early 1900s as logging camps were abandoned after forestry operations in an area were completed, and the company then permitted loggers to use and maintain them, primarily as hunting and fishing camps. Construction and use of privately owned camps on timber company lands began in the 1930s and accelerated in the 1960s. Camps were built on approximately 1-acre lots that were leased through an annual payment to the timber company. Ownership and use of these camps were often passed within families from generation to generation. About 190 camps were present on the 133,000 acres of Champion International Corporation lands in Essex County, Vermont, at the time of the sale of these lands to the Service, the Vermont Agency of Natural Resources, and Essex Timber Company (now Plum Creek Corporation) in 1999. Fifty-nine of these camps were located on the 26,000-acre parcel that was purchased by the Service as the Nulhegan Basin Division of the refuge.

The camps are located in the spruce-fir, northern hardwood, and mixed conifer/hardwood habitats that are typical on the division. Wildlife species occurring in the vicinity of camps include: various migratory birds, ruffed grouse, snowshoe hare, moose, white-tailed deer, black bear, various furbearers, reptiles and amphibians, and brook trout.

The majority of camps are of one-story, wood or log construction. Camps typically are small (<600 square feet). Expansions of camp size or additional buildings are not allowed, but routine maintenance of structures is permitted. No utilities service the camps. Water is obtained from pond, stream, or spring sources via a gravity flow system or from a generator-powered pump, or is hand carried to the camp from on or off the division. Heat is usually supplied by wood stoves. Firewood is either brought to the site from an off-refuge source or is cut from the lot, and is restricted to dead or downed wood only. Bottled (LP) gas in above-ground portable tanks is often used to power cooking stoves, refrigerators, and ceiling lamps. Most camps have separate, outdoor privies, but some have underground septic tanks. Cutting of live vegetation is restricted. The camp lots are not posted but the public is expected to reasonably respect the privacy of camp owners while using the division. Permitees are not allowed to restrict or interfere in any way with public use of the division, and are not granted exclusive use of any shoreline or water body. The construction of new cabins will not be permitted.

**(b) Where would the use be conducted?**
The 30 camps are scattered across the division, including the shoreline of Lewis Pond and along the branches of the Nulhegan River. An additional eight camps may be acquired with the McConnell Pond tract pursuant to the Comprehensive Conservation Plan's preferred alternative. Camps occur in all four towns in which the division is located: Bloomfield, Brunswick, Ferdinand, and Lewis. The McConnell Pond tract occurs primarily in the town of Brighton.

**(c) When would the use be conducted?**
Use of camps occurs year-round, but the duration of use is short-term. Generally the deer hunting season (mid- to late November) is the heaviest period of use. Otherwise, use occurs in an intermittent fashion, primarily on weekends. Use wanes significantly after late December through the winter and mud season, and then increases after the Memorial Day weekend. The number of people using an individual camp during any given stay varies greatly from one or two to perhaps eight or more during deer season. Camps are sometimes accessed via snowmobile in the winter from the statewide snowmobile trail system, which runs through the division, and occasionally via cross-country skis or snowshoes. Only seasonal use is permitted. The camps cannot be used as permanent, year-round residences.

**(d) How would the use be conducted?**
During the process leading up to acquisition of the division, the Service agreed to permit occupancy and use of those camps on the division for the life of the current lessees up to a 50-year maximum, as long as the use was determined to be compatible (USFWS 1999). Under no circumstances will occupancy and use of the existing camps on the division extend beyond July 21, 2049. Should the McConnell Pond tract be acquired, leases for those cabins occurring on that property will also terminate no later than July 21, 2049, pending negotiations with the current landowner. Under Service land ownership, use and occupancy of these camps will be administered through a SUP (SUP) system, the conditions of which are analogous to the former lease. We review the language and renew permits at a 5-year interval. The next renewal is slated for 2016. Permit fees are based on the appraised value of the property, which is determined by a market appraisal to be performed roughly every five years, as stipulated in the SUP.

Currently, 30 camps remain in private use: 22 are privately owned (meaning the private individual owns the cabin structure) and 8 are under term use agreements (meaning the Service owns the structure, but a private individual is leasing it for a pre-defined amount of time). The SUP for privately owned cabins expires in 2049 (50 years after the land was purchased). A term use compensates the leaseholder for his/her equity in the structure and the value of their use of the camp until 2049. The leaseholder decides the period of the term and approximately one percent of the value is deducted for each year of continued use. The duration of existing term use agreements ranges from 10 to 37 years. Holders of term use agreements must still adhere to the provisions of the permit, including the payment of annual lease fees and maintenance of adequate insurance. The Service also owns an additional two vacant structures.

The annual permit fee currently is $950, and $1,125 for the camps adjacent to Lewis Pond. These fees were increased in 2011, based on a market appraisal. Previously, fees had remained at $550 and $650, the same rates that were charged by Champion International at the time of purchase by the Service.

Property taxes on the value of the tenant-owned improvements are paid to the respective towns by the camp owners. The camps traditionally were associated with the area of surrounding use, usually approximately 1 acre. Most camps can be accessed by motor vehicle via gravel roads, but some can be accessed only by foot or boat.

The conditions of the SUP require that cabins must be maintained in a manner compatible with the purposes of the refuge and produce the least amount of environmental disturbance. Cabins may only be used for non-commercial recreational purposes, and cannot be used as a principal place of residence. Modifications of existing structures require prior approval by the refuge manager. Cutting live vegetation is restricted. We do not post the camp lots, but expect the public to reasonably respect the privacy of camp owners. A complete description of the permit conditions is attached (attachment 1).

**(e) Why is this use being proposed?**
Camp use is an important traditional use of timber lands in this region of Vermont, and this use predated acquisition of these lands by the Service. A 50-year phase-out of camps was a reasonable compromise between the agencies and public involved in the original land acquisition–and this was addressed and evaluated in the environmental assessment establishing the division (USFWS 1999). By managing this cabin lease program, the Service is following through on earlier commitments.

## AVAILABILITY OF RESOURCES:

Funds from permit fees are deposited in a national "collections" account and then reapportioned by Congress to the Service. Such funds returned to the refuge amounted to $6,000 in fiscal year (FY) 2011, $9,000 in FY12, and $7,470 in FY13. Staff time associated with administration of this use is primarily related to processing annual permit fees, answering questions of permitees concerning SUP conditions, monitoring compliance with SUP conditions, and monitoring potential impacts of the use on refuge resources and visitors. The program is principally administered by the wildlife refuge manager and forester. Resource impacts will be monitored by the wildlife biologist, who is already assigned to the refuge. No special equipment, facilities, or resources are needed to administer this use. Road maintenance and signage installation are performed as needed to ensure adequate facilitation of priority public uses for the general public; therefore these operations already are being administered with annual appropriations. Refuge law enforcement resources are not directed toward providing safety for Permitees or security for their property beyond that which is expected for the general visiting public. Maintenance of camps and associated lots are the responsibility of Permit holders.

We estimate below the annual costs associated with the administration of the cabin lease program on the division.

| | |
|---|---|
| *Program Oversight* (wildlife refuge manager): | $3,700 |
| *Processing Annual Permit Fees/Insurance* (forester): | $1,600 |
| *Resource Impact Monitoring* (wildlife biologist): | $1,000 |
| *Safety/Security* (federal wildlife officer): | $2,100 |
| **Total Annual Cost of Program:** | **$8,400** |

## ANTICIPATED IMPACTS OF THE USE:

Occupancy and use of privately owned camps on the division will not extend beyond July 21, 2049, as a matter of compliance with Title 50-*Wildlife and Fisheries*, Chapter 1, Part 26, Section 35 - *Cabin Sites*. Meanwhile, conditions for the permit are designed to help maintain the compatibility of this use, reduce negative impacts to refuge resources, and to minimize conflicts with refuge management and other uses of the refuge.

Possible impacts of this use include: direct loss of habitat, possible wildlife disturbances caused by camp occupancy or camp user travel along roads, slight additional hunting pressure on upland species, and impacts to sensitive wetland areas due to some camps being improperly located. Regarding direct loss of habitat, only approximately 35 non-contiguous acres are impaired during the short term. The Service has acquired, removed, and restored the habitat at 24 camp locations. This short-term use is not considered a significant impact on a 26,605-acre division. As permits expire or camps are sold to the Service most, if not all, camps will be relocated off-refuge or destroyed; therefore, there will be no long-term loss of habitat. Because the number of camps is low and they generally are not located in the proximity of any known major concentrations of waterfowl, shorebirds, or other wildlife, with the possible exception of wintering concentrations of white-tailed deer, and because travel and other activities by camp owners does not differ substantially in type or intensity than that allowed by the general public during allowed day-use activities, disturbance by occupancy and travel are not considered significant. Hunting, whether by camp occupants or the general public, is currently allowed according to State regulations and harvest levels are set so as not to impact game populations. Meanwhile, we designed the SUP conditions to help maintain the compatibility of this use, reduce negative impacts on refuge resources, and minimize conflicts among refuge management activities and other uses of the refuge. All camps have been inspected and no locations appear to be adversely affecting sensitive wetlands areas or other critical habitats. A Level I contaminants survey was performed on refuge lands prior to purchase and no contaminant problems were identified around camps. In addition, Level 1 surveys were completed on all the camps that have been acquired and no negative impacts were found.

This use is not anticipated to result in short-term or long-term impacts that would materially interfere with or detract from the fulfillment of the purposes for which the refuge was established or the mission of the National Wildlife Refuge System.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

See attached list of SUP Conditions (Attachment 1).

## JUSTIFICATION:

This use has been determined to be compatible provided the Permit Special Conditions are implemented. This use will not diminish the purposes for which the refuge was established, will not pose significant adverse effects on trust species or other refuge resources, will not interfere with public use of the refuge, nor cause an undue administrative burden.

The occupancy and use of privately owned recreational camps on the refuge will not materially interfere with or detract from the fulfillment of the purposes for which the refuge was established or the mission of the Refuge System.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

## LITERATURE CITED:

U.S. Fish and Wildlife Service. 1999. Final Environmental Assessment–U.S. Fish and Wildlife Service Participation in a Partnership to Protect "the Champion Lands" in Essex County, Vermont. 78 pp.

Attachment 1

# SPECIAL USE PERMIT CONDITIONS

for

PRIVATELY OWNED CAMPS

on the

NULHEGAN BASIN DIVISION

Silvio O. Conte National Fish and Wildlife Refuge

Essex County, Vermont

May 1, 2011

The Nulhegan Basin Division of the Silvio O. Conte National Fish and Wildlife Refuge (Refuge) is a unit of the National Wildlife Refuge System (System), administered by the U.S. Fish and Wildlife Service (Service), a bureau of the U.S. Department of the Interior. The mission of the System, as stated in the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), is: *"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."*

The legislation further recognizes wildlife-dependent recreational uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation as the priority public uses of the System. All uses of a refuge (including occurrence, use, and occupancy of privately owned camps) must be compatible with the System mission and the purposes of the individual refuge. A compatible use is a proposed or existing wildlife-dependent recreational use or any other use of a refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge. Although the conditions below cannot in any way guarantee compatibility, they are designed in part to create the foundation for compatible use.

Camps were built and occupied through recreational leases on lands formerly owned by Champion International Corporation and St. Regis Paper Company, and maintenance of the existing camp sites was part of the Service's commitment in the Environmental Assessment (EA) that authorized the project when the property was acquired (U.S. Fish and Wildlife Service 1999). This special use permit (SUP) replaces the previous permit, which expired April 30, 2011, and will remain in effect through April 30, 2016. The use of the word "Premises" hereinafter refers to the privately owned camp and any associated buildings, and an approximately one-acre site on which such buildings are located as indicated on the "As-built Sketch" maintained in the Refuge's files. This Permit will be subject to the following conditions, to which the Permitee agrees to abide. The use of the term "Permitee" refers collectively to all leaseholders of record as of July 21, 1999. Violation of any of the following conditions will be grounds for termination of the permit at the sole discretion of the Service. In the event of Permit termination, Permitees may appeal the decision as provided in Title 50 - Code of Federal Regulations - Section 25.45 "Appeals Procedures," available upon request from the Refuge Manager.

## 1. Term.

A. The term of the Permit will be five (5) years, commencing May 1, 2011 and may be renewed for additional terms of five years, contingent upon compliance with all terms and conditions of this Permit, and on a determination by the Service that continued occupancy of the Premises is compatible with the purpose for which the Refuge was established, which determination will be re-evaluated every five years. However, Permits will not be renewed to allow any occupancy or use of the Premises beyond the life of the Permitee except in the case of an heir of the original Permitee as provided in Section 11 "Permit Assignment". Either party may cancel this Permit by giving notice in writing to the other party at least thirty (30) days prior to the last day of the original term or any renewal term, as applicable, unless sooner terminated under the provisions of this Permit. It is the intent of the Service to renew camp Permits for a maximum of fifty (50) years from date of Service acquisition of the Refuge, July 21, 1999, subject to compliance with Permit conditions and continued compatibility (see pages 20, 55, and Appendix 3, page 2 in "Final Environmental Assessment - U.S. Fish and Wildlife Service Participation in a Partnership to Protect 'the Champion lands' in Essex County, Vermont"- May 1999).

B. If the Permitee chooses to not renew this Permit, the Permitee may:

(1) subject to the availability of funding, sell his or her camp to the Service at Market Value based on an appraisal conducted for the Service;

(2) request that the Service move his or her buildings off the Refuge to another site within 50 miles, provided the cost is less than the purchase value and such action is deemed by the Service to be fiscally and environmentally prudent, when compared to the purchase of the building by the Service at Market Value and the cost of site remediation following the termination of the Permit.

*The Uniform Relocation Assistance and Real Property Acquisitions Policy Act* will guide the Service procedures for acquiring camps on the Refuge. Information about these procedures is available upon request from the Refuge Manager. Upon termination or cancellation of this Permit, the Permitee agrees to vacate the

Premises in an orderly fashion, remove all personal property, and leave the Premises in a neat and orderly condition.

## 2. Payments.

A. Permitee will pay a fee of ($_____.00) Dollars, annually to U.S. Fish and Wildlife Service, Silvio O. Conte Refuge, Nulhegan Basin Division, 5396 Rt. 105, Brunswick, VT 05905, at the time of the signing of this Permit, and annually thereafter. Payment must be received on or before May 1 each year. Permitee shall pay the annual fee, in full, without demand. Payment shall be made by certified check or money order and shall be made out to: "U.S. Fish and Wildlife Service."

B. The Service reserves the right to increase/decrease the fee for the succeeding term or alter the terms of this Permit by providing the Permitee with written notice of the same at least forty-five (45) days prior to any annual renewal. Permit fee amounts will be determined based on market analysis of comparable camp leases in the area. Fee amounts will be analyzed through market analysis approximately every five years and readjusted if necessary. Fees received by the Service after May 1, will be deemed past due, and Permitee shall pay interest on a daily basis at a rate of 5 percent per year on amounts past due thirty (30) days or more. Failure to pay Permit fees for ninety (90) days or more beyond the due date shall constitute a breach and shall result in automatic termination of the Permit without further act or deed on the part of the Service or Permitee; upon such occurrence, the Service may take possession of the structures on the Premises (See Section 14 below).

## 3. Occupancy of the Camp.

By acceptance of this Permit, Permitee hereby warrants and represents that:

(a) the Premises shall be occupied and/or used by the Permitee and his or her guests for the sole purpose of noncommercial recreational use.

(b) the Permitee bears full responsibility for his or her guests, their use of the Premises, and their compliance with these Permit conditions. Violation of any of the permit conditions by the Permitee or their guests will be grounds for termination of the permit at the sole discretion of the Service.

(c) subletting of the Premises for fee or donation is prohibited.

(d) the Premises shall be occupied and/or used only in such manner and purpose that is in compliance with all applicable federal, state, or local laws, statutes, regulations, rules, or ordinances, including zoning ordinances and regulations, and

(e) the Premises shall NOT be used as a principal or year-round residence.

## 4. Use.

Subject to all conditions contained herein, Permitee will have the right to occupy and use the existing buildings and improvements (for purposes of this Permit, "improvements" will mean improvements to the Premises, including, but not limited to roads and paths). No additional structures, roads, or paths may be constructed. Permitee may not locate any trailers (excepting e.g., utility trailers, snowmobile trailers), busses, or campers on the Premises.

Permitee shall not build roads or driveways on the Premises or any other Refuge lands, nor have any public utility service installed.

Permitee will fully comply with all federal (including refuge-specific regulations), state, and local statutes, rules, and regulations controlling and regulating hunting, fishing, the use of firearms, the use of off-highway recreational vehicles including snowmobiles, and outdoor fires. Campfires (including cooking fires) will be permitted if they are contained and located in such manner as not to present a risk of fire escape. Such fires will not be permitted off the Premises, nor during bans on burning issued by the local Forest Fire Warden or other applicable authority, including the Refuge Manager. Open fires, including but not limited to the burning of brush, trash, or debris, are prohibited, except with prior written permission from the Refuge Manager and any other necessary permit (municipal, fire warden and/or state).

Permitee will use every precaution to prevent damage to the Premises by fire, vandalism, malicious mischief or otherwise and will take all reasonable action to suppress any fire and report any act of vandalism or mischief which may occur and immediately notify Refuge Manager of any fire or vandalism damage. The opening of any chimney will be equipped with an adequate spark arrester or screen with a mesh size no larger than one-half inch.

Permitee shall not cut or destroy any tree or shrub, including hazard trees, on the Premises (excepting firewood, see below) without obtaining prior specific written permission from the Refuge Manager.

Permitee will not pile brush resulting from any allowed cutting, but will reduce the brush to a reasonable size and spread it over a large area. Permitee shall not enlarge the area of open space on the Premises.

Cutting of firewood will be for the purpose of camp use only, and firewood shall not be removed from the Premises. Only trees downed by natural causes within or adjacent to the Premises, or those that have fallen as a result of natural means across a Refuge roadway, or other trees as specified by the Refuge Manager, may be cut for camp firewood. The importation of firewood can serve as a means of introducing several harmful insect species which can have a devastating effect on our forests. Two of the species of greatest concern are the Asian longhorned beetle and the Emerald ash borer. For this reason, only firewood from Essex, Caledonia, Orleans, Orange, and Washington Counties, Vermont, and Coos and Grafton Counties, New Hampshire, may be imported to the Refuge.

The soil of the Premises or any other Refuge lands may not be cultivated, except for small gardens, not to exceed 200 square feet, located within the Premises specifically for camp use. No exotic or invasive plants will be cultivated on the Premises or any other Refuge lands, except for garden vegetables and fruits (within the Premises only). Use of pesticides or herbicides in gardens, or elsewhere on or off the Premises, is prohibited.

Permitee shall keep the Premises neat and clean and shall dispose of all garbage, trash, and debris by removing all such material from the property and returning the same to its place of origin or depositing it in some municipal or other governmental approved solid waste disposal areas. Garbage, trash or any other wastes shall not be burned on the Premises without prior written permission from the Refuge Manager and any permits required by any governing local or state authority, and shall not be burned elsewhere on the Refuge, nor shall it be dumped into lakes, ponds, streams, or any lands of the Refuge. Permitee will comply with all applicable solid waste laws imposed by the State, Town, or Municipality.

If the use of the Premises by Permitee, guests, or invitees is of such a nature as to constitute a threat to public safety, a nuisance or annoyance to other Permitees, Refuge staff, or visitors, or causes, in the sound professional judgment of the Refuge Manager, a diminution in the value of other property in the vicinity, the Refuge Manager will have the right to demand that such use be abated, and may terminate this Permit for failure to comply with any such demand in the time specified by the Refuge Manager by serving written notice on Permitee.

With the exception of gasoline; diesel fuel; motor oil; engine, vehicular, and chainsaw lubricating fluids; antifreeze; heating fuels; bottled gas; insect repellents; and materials used in the routine operation and maintenance of the improvements on the Premises, in quantities reasonable for camp use, all of which must be stored in a safe manner in sealed, above-ground containers, Permitee may not store or allow to be stored on the Premises, or elsewhere on the Refuge, any hazardous material as defined by the U.S. Environmental Protection Agency. Permitee shall not dispose of, or allow the disposal of any hazardous substances, including those substances and materials specifically listed above, on the Premises or elsewhere on the Refuge. Permitee shall indemnify, defend, save and hold harmless the United States of America and the Service from all losses, claims, damages, environmental injuries, expenses, response costs, remediation expenses, allegations or judgments (including fines and/or penalties) arising out of the activities of the Permitee, its agents and contractors relating to or in any way connected with the presence or release of such hazardous material in or on the Premises. The said obligation to indemnify shall survive the termination or expiration of this Permit.

## 5. Sanitation.

Subject to the approval of the Refuge Manager, Permitee will provide proper disposal of septic (for the purposes of this Permit, "septic" will mean, but is not limited to, sewage, wash water, and slop water), and other waste in compliance with all applicable federal, state, and local laws and in a manner so as not to be

objectionable or detract from the aesthetic values of the general area. Permitee shall not discharge any untreated or partially-treated sewage or other waste materials directly or indirectly (e.g., through any ditches, gullies, or above-ground or below-ground piping, except as may be provided for below) into any stream or other body of water.

Properly planned and designed sanitary toilet facilities are required for all sites. Appropriate facilities include, but are not limited to, incinerator, chemical, compost, privy or sub-surface waste-water systems. Type, design, placement, and construction of any future toilet and sanitary facilities will be selected to minimize damage to Refuge air, lands, and water. Properly constructed privies (dug pit toilets) will be allowed provided they meet this requirement, conform to local and State requirements, and are located more than 100 feet from any stream or other water body.

All future construction of toilets and sanitary facilities including waste water disposal systems must be approved in advance in writing by the Refuge Manager, be built in accordance with all applicable codes, and be properly permitted and inspected by the governing local or state authority. It is the Permitee's responsibility, after securing written permission for construction from the Refuge Manager, to secure the proper permits and provide copies to the Refuge Manager, prior to any construction activity.

Permitee bears the responsibility for any noncompliance with all federal, state, and local laws and regulations governing septic and other waste disposal, and Permitee will indemnify, defend, save and hold the United States of America and the Service harmless from and against any and all actions, suits, damages, and claims by any party by reason of noncompliance with such laws and regulations. The said obligation to indemnify will include all costs and attorneys' fees and shall survive the termination of this permit.

## 6. Maintenance and Improvement.

This Permit allows use of existing structures and improvements only. No additional permanent structures may be constructed or installed. Permitee shall not enlarge the area of open space on the Premises. The Permitee may perform routine maintenance of buildings. For the purposes of this Permit, "routine maintenance" is defined as repairs made to any of the existing privately owned buildings on the Premises in order to sustain their intended useful purpose and to prolong their useful life expectancy, but shall not include substantial rebuilding or remodeling of any existing structure, except in the case of approved repairs in response to destruction of less than 80 percent of the structure(s) due to disaster. Driveway and road surfaces, bridges, culverts, and similar structures may not be modified, replaced, or rebuilt without prior written approval of the Refuge Manager. Driveways and road surfaces may not be enlarged or hard-surfaced. Mowing of camp lawns, pathways to outbuildings, and camp driveways is permitted.

No substantial improvements will be allowed. Examples of substantial improvements include, but are not limited to, expansion of cabin size, other permanent additions including storage sheds, porches or decks, and constructing, enlarging, or paving driveways and roads.

No rebuilding of any structure will be allowed in the event of a loss of 80 percent or more of the area of the structure due to fire, flood, earthquake or other disaster.

## 7. Access.

Permitee may access the Premises by the route existing at the time of the acquisition of the land by the Service, subject to the conditions set forth herein. However, the Service retains the right to restrict or deny vehicular access to the Premises if such access poses a risk to human safety, creates such an environmental risk that compatibility can no longer be ensured, could result in damage to refuge facilities such as roads, or otherwise materially conflicts with Refuge management needs.

Although the Service will maintain access for Permitees along with other refuge visitors on existing roads within its budget and capabilities, nothing herein shall imply any duty or obligation upon the Service to construct or maintain specific roads, paths, trails, culverts, or bridges to the Premises, that, in the sound professional judgment of the Refuge Manager, would solely or primarily benefit the Permitee. Any payment received by the Service is solely for the use of the subject Premises and does not provide the Permitee with the guarantee of any greater rights of access over Refuge property than is provided to the general public.

Road maintenance, including snow plowing, will be performed by the Service only as necessary for the Refuge's management operations and other administrative needs. Maintenance of any road or associated structure by the Service solely for the benefit of Permitee is not implied and should not under any circumstances be expected. However, if the Service ceases to maintain a road necessary for Permitee's access to the Premises, Permitee may maintain, at his own expense, said road with prior written permission from the Refuge Manager.

The Service retains the right to close, lock, or otherwise restrict vehicular (including snowmobile) access to the public, including Permitees, along, through or over roads, gates, bridges, or rights of way under its control at any time including but not limited to, the snowmobile and spring mud seasons, periods of high fire danger, when forestry operations, road, or other conditions make such access hazardous, or when such restrictions are necessary for refuge management purposes, in the professional judgment of the Refuge Manager. Permitees whose camps are not situated on a trail within the Vermont Association of Snow Travelers, Inc. (VAST) trail system must secure a separate SUP from the Refuge Manager to access their camps via snowmobile from the closest point on the nearest VAST trail or public highway, as approved in advance by the Refuge Manager. The Service advises that logging trucks always have the right of way. Permitees and their invitees, guests, employees or agents, must be alert at all times on any road for logging trucks and equipment as well as for possible road hazards such as fallen trees, limbs, and other road damage or washouts resulting from heavy rains, beaver flooding, damaged culverts or other causes.

Permitees shall under no circumstances close, lock, or otherwise restrict access along, through, or over existing roads, gates, or rights of way on Refuge lands, except for the gating of camp driveways, with prior permission of the Refuge Manager. No driveway gates will be installed without prior written consent of Refuge Manager and approval of the design and placement. Under no circumstances shall cables or chains be used to restrict access on camp driveways, or elsewhere on the Refuge. Permitees will provide a key or combination for any lock on an existing or new driveway gate to the Refuge Manager, upon request.

During any time that a gate used to control access to a camp blocks any Refuge road to vehicular travel due to closure of said gate, then the respective Permitees and their guests or invitees that use said gate and road to access their camp will be restricted to direct travel to and from the camp for purposes of ingress and egress only and shall not drive any motorized vehicle beyond the point necessary to access said camp.

## 8. Privacy and Security.

The Service reserves the right for itself and its agents and assigns (not including the general public), to pass freely over the Premises at any and all times, by foot or with vehicles necessary in the pursuit of Refuge operations and programs, during reasonable hours. Entry into buildings by the Service will only be allowed for law enforcement personnel in the event of executing a search warrant, or in the presence of the Permitee, for the inspection of interior building spaces to ensure compliance with the conditions of this Permit.

The Permitee may not take any actions to discourage legitimate (authorized by the Service) public access on Refuge lands. The Permitee will not have exclusive rights to any shoreline area or water surface area. However, the Refuge will publicize in their public use documents and guidance that Permitees' occupancy and use of the Premises should be treated with respect and that the Premises should be reasonably avoided by the public. The Permitee may not post signs at the boundaries of the Premises, or any gate, road, or driveway without the Refuge Manager's prior written permission and approval of the wording, construction, and placement of any signs. If refuge visitors, or others, cause any problems with authorized use of the Premises or the Permitee's property on the Premises, the Permitee should notify the Refuge Manager so that appropriate action may be taken by the Service.

Although Service law enforcement personnel may, as a by-product of their presence while performing their routine duties, deter thefts and break-ins, nothing herein shall imply any duty or obligation upon the Service to provide increased security services for the camps or their contents, beyond that which reasonably would be expected for the protection of the general visiting public.

## 9. Fiscal Liability.

Permitee agrees that all taxes, charges, assessments, and other impositions levied upon their buildings, improvements, and fixtures thereon shall be paid by the Permitee when due and payable.

## 10. Permitee's Liability for Damages.

Permitee will be responsible to the Service for any damages caused directly or indirectly by Permitee or his guest(s), invitees, employees, or agents, including, but not limited to, surface damages or damage to terrestrial or aquatic habitats or resources, interference or meddling with any tools, machinery, equipment, gates, buildings, signs, Refuge employees, or other Refuge visitors, on or off the Premises.

## 11. Permit Assignment.

Permitee understands and acknowledges the only interest in the Premises held by the Permitee is that of a Permit holder and that nothing in this agreement shall be construed to imply that the Permitee has any property interest in the Premises, other than ownership of the structures and personal property items thereon. Permitee has no authority, right or power to sell, convey, transfer, sublet, assign, give, devise or otherwise encumber the Premises, any portion of the Premises, or any structure on the Premises, except as otherwise permitted by this Permit or by the Service's prior written permission.

Permits are only issued to original lease holders (Champion International Corporation lease holders of record as of July 21, 1999) and may not be transferred to third parties. Should original lease holders wish to withdraw their interest, they may transfer it to others who were original lease holders on the same lease, but not to an outside party who was not a lease holder of record on July 21, 1999.

In the event that an individual original Permitee dies within the first twenty years after the July 21, 1999 purchase of the land by the Service, a transfer by inheritance of the original Permitee interest in the buildings will allow the heir(s) to become a Permit holder provided that such transfer shall be subject to all terms and conditions of this Permit. However, all transfers due to this inheritance clause during the first 20 years will terminate on July 21, 2019. For the purposes of this Permit, an "heir" is defined as a relative by blood, or as a relative otherwise may be specified by the laws of the state of Vermont. In order to designate an heir for the purposes of this Permit, a letter of such designation naming an heir must be sent to the office of the Nulhegan Basin Division of the Silvio O. Conte Refuge (address given under "Section 22. Notices" below) for inclusion in the appropriate camp file. Letters having designated an heir must be on file at the refuge office in advance of a Permitee's death. Issuance of a new Permit will be required upon transfer through inheritance. Any such transferred Permits will expire not later than July 21, 2019. After July 21, 2019, the interest of any deceased Permitee will lapse. The death of an original lease holder will not affect the Permit status of any surviving original lease holders of record for that camp.

## 12. Insurance.

The Permitee shall be required to acquire and maintain during the term of this Permit, Comprehensive General Liability insurance against claims occasioned by the actions or omissions of the Permitee, his/her agents, employees, invitees, and/or guests while engaged in the activities authorized hereunder. Such insurance shall be in a form and amount satisfactory to the Service and in an amount commensurate with the degree of risk and the scope of such activities authorized hereunder, but in any event not less than $300,000 per occurrence. All liability policies shall specify that the insurance company shall name the "United States of America" as an additional named insured and shall provide that the insurance company shall have no recourse against the Government for payment of any deductible, premium or assessment; or, alternatively, if the United States of America is not named as an additional insured, the liability policy shall specify that the insurance company shall have no right of subrogation against the United States, its agents, servants and employees and shall provide that the insurance company shall have no recourse against the Government for payment of any deductible, premium or assessment. A certificate of insurance indicating that the required insurance and specifications are in effect and the annual premium is paid in advance shall be provided by the Permitee to the Refuge Manager with the annual payment, or submitted at the time of policy renewal, and anytime within thirty (30) days of the Refuge Manager's request for such documents. The Permitee shall provide to the Refuge Manager thirty (30) days advance written notice of any material change in the Permitee's insurance coverage hereunder.

## 13. Liability.

Permitee assumes full control of the Premises "as is," and the Service makes no warranty as to the habitability or condition of the Premises. Permitee also will inform the Refuge Manager immediately of any personal injuries and/or property damage in excess of $500 suffered by any person on the Premises, and of all risks, hazards, and dangerous conditions of which Permitee becomes aware elsewhere on the Refuge. The Service shall not be liable to Permitee for any injury or harm to any person, including Permitee, occurring in or on the Premises or on any other lands of the Refuge or for any injury or damage to the Premises, to any property of the Permitee or to any property of any third entity.

In consideration of being permitted to engage in the activity authorized under this Permit at the Nulhegan Basin Division of the Silvio O. Conte National Fish and Wildlife Refuge, the Permitee, being of lawful age, for himself and his personal representatives, heirs, and next of kin, hereby releases, waives, and forever discharges the United States of America, its agents, and employees, all for the purposes herein referred to as, Releasees, from any and every claim, demand, action or right of action, of whatsoever kind or nature, either in law or in equity, arising from or by reason of any bodily injury or personal injuries known or unknown, death and/or property damage resulting or to result from any injury, which may occur while engaged in the permitted activity, and covenants not to sue the Releasees, for any loss or damages, and any claim or damage therefore, on account of injury to the person or property or resulting in death of the Permitee, whether caused by the negligence of Releasees or otherwise. Permitee agrees to indemnify, defend, save, and hold harmless the Releasees and each of them from any loss, liability, damage, or cost Releasees may incur due to the presence of Permitee in or upon the said property of the United States. Releasor agrees that this release and waiver are intended to be as broad and inclusive as permitted by the laws of the State of Vermont and that if any portion thereof is held invalid, it is agreed that the balance shall notwithstanding, continue in full legal force and effect. The said obligation to indemnify shall survive the termination or expiration of this Permit.

Permitee shall further indemnify the Service against all actions, suits, damages, and claims by whomever brought or made by reason of the nonobservance or nonperformance of:

(a) any obligation under this Permit; or
(b) any federal, state, local law or regulation.

## 14. Default.

Any of the following will constitute a default under this Permit:

(a) Permitee's failure to perform any obligation under this Permit or the violation of any term or condition of this Permit,

(b) the filing of any bankruptcy/insolvency petition by or against Permitee or if Permitee makes a general assignment for the benefit of creditors, or

(c) an execution or attachment issued against the Permit, the Premises, or Permitee's property on the Premises, unless Permitee provides the Refuge Manager with satisfactory assurances and evidence that such execution or attachment will be released within a reasonable time.

In the event of a default, the Permitee will have ninety (90) days following receipt of written notice from the Service to cure the default. If the default is not so cured, then the Service shall have all its remedies provided by law and hereunder, including terminating the Permit by written notice to the Permitee stating the reason for termination, and entering the Premises. The Service may take possession and retain Permitee's personal property that is on the Premises, including all structures, to secure the performance of any obligation under the Permit, subject to any right of any compensation which may be owed to the Permitee. The Service may, at its option, re-enter and take possession of the Premises after a default without releasing Permitee's obligation to perform under the Permit. Notwithstanding any provision to the contrary contained herein, the Service has the right, but not the obligation, to sell, remove, or destroy structures and improvements remaining on the Premises after Permitee has vacated or been evicted from the same. In the event of default and subsequent Permit termination, the Permitee has the ability to appeal the termination action as specified in Title 50 - Code of Federal Regulations - Section 25.45 "Appeals Procedures," available upon request from the Refuge Manager.

## 15. Security Agreement.

Permitee hereby grants the Service a security interest in all of Permitee's improvements, fixtures, and personal property to secure the obligations of the Permitee hereunder. Permitee hereby grants the Service the right to perfect this security agreement by taking possession of the secured property upon Permitee's default under this Permit.

## 16. Mechanic's Lien.

If any notice is filed at the county registry of deeds of a builder's, supplier's or mechanic's lien on the Premises, arising out of any work performed by or on behalf of Permitee, Permitee shall cause such lien to be discharged or released immediately and shall indemnify the Service against any such claim or lien, including all costs and attorneys' fees that the Service may incur in connection with the same.

## 17. Succession.

This Permit shall be binding upon the heirs, executors, administrators, successors in interest and assigns of the parties hereto.

## 18. Waiver.

Any consent, express or implied, by the Service to any breach by Permitee of any covenant or condition of this Permit shall not constitute a waiver by the Service of any prior or succeeding breach by Permitee of the same or any other covenant or condition of this Permit. Acceptance by the Service of any fee or other payment with knowledge of a breach or default by Permitee under any term of this Permit shall not constitute a waiver by the Service of such breach or default.

## 19. Savings Clause.

The invalidity or unenforceability of any provision of this Permit shall not affect or impair the validity of any other provision.

## 20. Rights and Benefits.

The rights and benefits conferred by this Permit shall be subject to the laws of the United States governing the Service and to the rules and regulations promulgated hereunder, whether now in force or hereafter enacted or promulgated.

## 21. Anti-deficiency Provision.

Nothing contained herein shall be construed as binding the Service to expend in any one fiscal year any sum in excess of appropriations made by Congress or administratively allocated for the purposes of this Permit for the fiscal year, or to involve the Service in any contract or other obligation for the further expenditure on money in excess of such appropriations or allocations.

## 22. Notices.

Any official notice regarding fiscal matters, including payment of the annual Permit fee, or the status of Permits or Permitees to be given to either party under provisions of, or with respect to, this Permit shall be given by certified, United States mail, and addressed to the U.S. Fish and Wildlife Service, Nulhegan Basin Division, Silvio O. Conte Refuge, 5396 Rt. 105, Brunswick, VT 05905 (by the primary contact only). Correspondence from the Refuge to the Permitee will be addressed to the primary contact only at the primary contact's address of record. Any notice will have been deemed given when so mailed. It will be the responsibility of the Permitee to promptly inform the above-referenced office of any change of address and phone number applicable to Permitee contacts.

All such written correspondence with regard to any and all references made herein to "Refuge Manager," including but not limited to, requests for permission and approvals, notification of troubles or damages, other matters of concern or question about the Premises, or clarification of or compliance with Permit conditions or Refuge regulations shall be given to: Refuge Manager, Silvio O. Conte Refuge, Nulhegan Basin Division, 5396 Rt. 105, Brunswick, VT 05905.

**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Research Conducted by Non-Service Personnel

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Research Conducted by Non-service Personnel

## NARRATIVE:

Research by non-U.S. Fish and Wildlife Service (Service) personnel on the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge) is conducted by academic institutions, Federal, State, and local agencies, non-governmental organizations, and qualified members of the general public. Only research that is relevant, applicable, and useful to the refuge or the National Wildlife Refuge System (Refuge System) would be allowed. The primary purpose of this use is to further our basic understanding of the refuge's biological and cultural resources, and to inform our management decisions that affect those resources. In many cases, research by non-Service personnel ensures the perception of unbiased and objective information gathering, which can be important when using the research to develop management recommendations for politically sensitive issues. Additionally, universities and other Federal and State partners can often access equipment and facilities unavailable to refuge staff for analysis of data or biological samples.

Research conducted by non-Service personnel would also help the refuge to better achieve the goals of the Comprehensive Conservation Plan (CCP) because the data would help evaluate objectives and strategies identified in the plan. In addition, allowing research supports one of the purposes for which Conte Refuge was established: "provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes…"

The Service would encourage and prioritize research and management studies on refuge lands that would improve and strengthen natural resource management decisions. The refuge manager would particularly encourage research supporting approved refuge goals and objectives that clearly improves land management decisions related to Federal trust resources, helps evaluate or demonstrate state-of- the art techniques, and/or helps address or adapt refuge lands to climate and land use change impacts.

Refuge staff would also consider research for other purposes that may not be directly related to refuge-specific goals and objectives, but contribute to the broader enhancement, protection, use, preservation, and management of cultural resources and native populations of fish, wildlife, and plants, and their natural diversity within the Northeast region or Atlantic flyway. All research proposals must also comply with the Service's compatibility policy.

Evaluating and accepting or rejecting study proposals, as well as conditioning the special use permits (SUP) appropriately, would minimize the impacts of, and maximize the value of, such research. If a research project occurs during the refuge's hunting season, special precautions would be required and enforced to ensure the researchers' health and safety. If conducted according to refuge-specific stipulations set forth in an approved compatibility determination and in a project-specific SUP, this use would not affect the Service's ability to protect, conserve and manage wildlife and their habitats, nor would it impair existing wildlife-dependent recreational uses or reduce the potential to provide quality, compatible, wildlife-dependent recreation uses into the future.

Research therefore has been found appropriate because it is beneficial to the refuge's natural and cultural resources, is consistent with the goals and objectives of the CCP, and supports one of Conte Refuge's purposes.

# COMPATIBILITY DETERMINATION

## USE:

Research Conducted by Non-service Personnel

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is it a priority public use?**
This determination covers low impact research projects; namely, those projects with methods that only have a minimal potential to adversely impact cultural resources and native wildlife and plants.

This is not an all-inclusive list, but examples of the types of research that would be allowed include: mist-netting for banding or tagging birds, point count surveys, fish and amphibian tagging, electrofishing, radio-telemetry tracking, use of cameras and recorders, use of live or other passive traps, or non-destructive searches of nests, dens, or burrows.

Research activities allowed under this determination would not result in long-term, negative alterations to species' behavior (e.g. result in wildlife leaving previously occupied areas for long periods; modifying their habitat use; or, causing nest or young abandonment). No project would degrade wildlife habitat, including vegetation, soils, and water. Research associated activities that would not be allowed include, but are not limited to, those that would result in soil compaction or erosion, degrade water quality, remove or destroy vegetation, involve off-road vehicle use, collect and remove animals or whole native plants, cause public health or safety concerns, or result in conflicts with other compatible refuge uses.

Refuge support of research directly related to refuge goals and objectives may take the form of funding, in-kind services such as housing or use of other facilities, vehicles, boats, or equipment, direct staff assistance with the project in the form of data collection, provision of historical records, conducting of management treatments, or other assistance as appropriate.

Research conducted by non-Service personnel is not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), and the Refuge System Improvement Act of 1997 (Public Law 105-57).

**(b) Where would the use be conducted?**
This use will be allowed on all refuge divisions and units, including lands acquired in the future pursuant to the final comprehensive conservation plan (CCP). The location of the research will vary depending on the individual research project that is proposed. An individual research project is usually limited to a particular habitat type, plant, or wildlife species. On occasion, research projects will encompass an assemblage of habitat types, plants, or wildlife. The research location will be limited to those areas of the refuge that are absolutely necessary to conduct the research project. The refuge may limit areas available to research as necessary to ensure the protection of Federal trust resources, or to reduce conflict with other compatible refuge uses. The methods and routes of access to study locations will be identified by refuge staff.

**(c) When would the use be conducted?**
The timing of the research may depend entirely on the individual research project that is being conducted. Scientific research will be allowed to occur on the refuge throughout the year. An individual research project could be short-term in design, requiring only one or two visits over the course of a few days, or be a multiple year study that may require regular visits to the study site. The timing of each individual research project will be limited to the minimum required to complete the project. If a research project occurs during the refuge hunting season, special precautions will be required and enforced to ensure public health and safety. The refuge manager would approve the timing (e.g., project length, seasonality, time of day) of the research prior to the start of the project to minimize impacts to wildlife and habitats, ensure safety, and reduce conflicts with other compatible refuge uses.

**(d) How would the use be conducted?**
Research activities will depend entirely on the individual research project that is conducted. The objectives, methods, and approach of each research project will be carefully scrutinized by the refuge manager before it will be allowed on the refuge. Only low impact research activities, such as those listed under section (a) above, are covered under this determination.

Research projects must have a Service-approved study plan and protocol. A detailed research proposal that follows the refuge's study proposal guidelines (see attachment 1) is required from parties interested in conducting research on the refuge. Each research proposal request will be considered, and if determined appropriate and compatible, will be issued a special use permit (SUP) by the refuge manager that includes the stipulations in this determination. The refuge manager will use sound professional judgment and ensure that the request will have no considerable negative impacts to natural or cultural resources, or impact visitors, and does not violate refuge regulations. Before initiating a research project that involves federally listed endangered or threatened species, an interagency Section 7 consultation process should be completed.

If approved, multi-year research projects will be reviewed annually to ensure that they are meeting their intended design purposes, that reporting and communicating with refuge staff is occurring, and that projects continue to be consistent with the mission of the Refuge System and purposes for which the refuge was established.

If the refuge manager decides to deny, modify, or halt a specific research project, the refuge manager will explain the rationale and conclusions supporting their decision in writing. The denial or modification to an existing study will generally be based on evidence that the details of a particular research project may:

- Negatively impact native fish, wildlife, and habitats or cultural, archaeological, or historical resources.
- Detract from fulfilling the refuge's purposes or conflict with refuge goals and objectives.
- Raise public health or safety concerns.
- Conflict with other compatible refuge uses.
- Not be manageable within the refuge's available staff or budget time.
- Deviate from the approved study proposal such that impacts to refuge resources are more severe or extensive than originally anticipate.

**(e) Why is this use being proposed?**
Quality, scientific research, including inventory and monitoring projects, are an integral part of refuge operations and management. Thorough research provides critical information for establishing baseline information on refuge resources and evaluating management effects on wildlife and habitat. Research results will help inform, strengthen, and improve future refuge management decisions, as well as inform management decisions on other ownerships with Federal trust resources in the Connecticut River Watershed and possibly elsewhere in the Northeast Region. For example, past projects on the refuge have studied federally listed species, such as Canada lynx, Puritan tiger beetles, and northeastern bulrush, or other species of conservation concern, such rusty blackbirds and Canada warbler. Research projects may also include evaluating habitat management treatments and the associated wildlife community response, as well as, measures of impacts from public uses on refuge lands.

The refuge manager would particularly encourage research supporting approved refuge goals and objectives that clearly improves land management decisions related to Federal trust resources, helps evaluate or demonstrate state-of-the-art techniques, and/or helps address or adapt to climate and land use change impacts.

Finally, quality scientific research is encouraged because it would support one of the purposes for which Conte Refuge was established: "provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes…"

## AVAILABILITY OF RESOURCES:

The resources necessary to provide and administer this use are available within current and anticipated refuge budgets. The bulk of the cost for research is incurred in staff time to review research proposals, coordinate with researchers, and write SUPs. In some cases, a research project may only require 1 day of staff time to write a SUP. In other cases, a research project may take many weeks, as the refuge staff must coordinate with students and advisors and accompany researchers onsite visits. These responsibilities are accounted for in budget and staffing plans.

We estimate below the annual costs associated with the administration of this use.

| | |
|---|---|
| *Review proposals, coordinate with researchers* (Refuge biologist): | $3,200 |
| *Review proposals, issue SUPs General coordination* (Refuge manager)*:* | $2,100 |
| *Vehicle, equipment, housing maintenance* (Maintenance worker): | $1,900 |
| **Total Annual Cost of Program:** | **$7,200** |

We do not anticipate charging fees.

## ANTICIPATED IMPACTS OF THE USE:

The Service encourages quality research to further the understanding of natural resources. Research by non-Service personnel contributes to the availability of the best available scientific information to support refuge management decisions.

Disturbance to wildlife, vegetation, water, soils, or cultural resources could occur while researchers are accessing study sites on vehicles or by foot, or while they are engaged in their project. The presence of researchers could also indirectly disturb wildlife. Potential impacts include:

- Trampling, damage, and killing of vegetation from walking offtrail (Kuss 1986, Roovers et al. 2004, Hammitt and Cole 1998).
- Soil compaction, soil erosion, and changes in hydrology from hiking on and offtrail (Kuss 1986, Roovers et al. 2004).
- Disturbance to wildlife that causes shifts in habitat use, abandonment of habitat, increased energy demands on affected wildlife, changes in nesting and reproductive success, and singing behavior (Knight and Cole 1991, Miller et al. 1998, Shulz and Stock 1993, Gill et al. 1996, Arrese 1987, Gill et al. 2001).

Overall, we expect that these impacts would be negligible because of the low number of researchers and because, under this determination, only low impact projects would be allowed. As indicated under (a) above, low impact projects are those that would only minimally impact cultural resources or native wildlife and plants, and would not result in long-term, negative alterations to species' behavior, or their habitat, including vegetation, soils, and water. Research would only be conducted in approved locations and at approved times of day and times of season to minimize impacts to sensitive habitats and wildlife.

Animals may be temporarily disturbed during direct or remote observation, telemetry, capture (e.g., mist-netting), or banding. In very rare cases, direct injury or mortality could result as an unintended result of research activities. Mist-netting and banding, which are common research methods, can cause stress, especially when birds are captured, banded, and weighed. In very rare cases, birds have been injured or killed during mist netting, or killed when predators reach the netted birds before researchers. In a study of mist-netting and banding at 22 bird banding stations in the U.S. and Canada, Spotswood et al. (2012) found that the average rate of injury was very low (0.59 percent; mostly from damage to the wings, stress, cuts, or breaks) and the average rate of mortality was also very low (0.23 percent; mostly from stress and predation). Overall, they found that the likelihood of injury differed among species (e.g., heavier birds were more prone to incidents) and some species were more vulnerable to certain types of injuries. To minimize the potential for injuries, researchers should be properly trained (Fair et al. 2010, Spotswood et al. 2012) and look for signs of stress (e.g., lethargy, panting, raising feathers, closing eyes), wing strain, tangling, and predation (Spotswood et al. 2012). Impacts can also be minimized by considering the species to be captured, mesh size of net, time of day, time of year, weather, the number of birds that need to be captured, and the level of predation (Fair et al. 2010).

Barron et al. (2010) found that transmitters attached for research can also negatively impact bird species by affecting their behavior and ecology. The greatest impacts from transmitters were increased energy expenditure and decreased the likelihood of nesting. They also found that the method of transmitter attachment had an impact on the likelihood of injury or mortality, with anchored and implanted transmitters having the highest mortality due to the need for anesthesia. Collar and harness transmitters also had high mortality rates because they could cause birds to become entangled in vegetation. To minimize these risks, researchers can avoid anchored/implanted transmitters and use adjustable harnesses and collars with weak links that allow the device to detach if it becomes trapped in vegetation (Barron et al. 2010).

The U.S. Department of Agriculture's Animal Welfare Information Center maintains a website with resources to help minimize stress, injury, and mortality of wildlife in field studies at: *https://awic.nal.usda.gov/research-animals/wildlife-field-studies*. Recommendations relevant to refuge research projects would be followed. Included on this site are links to the following guidelines to help researchers limit their impacts on wildlife:

- The Ornithological Council's "Guideline to the Use of Wild Birds in Research" (Fair et al. 2010).

- The American Society of Mammologists, "Guidelines of the American Society of Mammologists for the Use of Wildlife Mammals in Research" (2011).
- American Fisheries Society, "Guidelines for the Use of Fishes Research" (2004).
- American Society of Ichthyologists and Herpetologists, "Guidelines for Use of Live Amphibians and Reptiles in Field Research" (2006).

Researchers may also inadvertently damage plants (e.g. via trampling or equipment use) during the research project. To minimize impacts, the SUP will outline how researchers are allowed to access their study sites and use equipment to minimize the potential for impacts to refuge vegetation, soils, and water. We would not allow the collection and removal, or permanent damage, of any native plants under this determination.

Overall, allowing well-designed, properly reviewed, low impact research to be conducted by non-Service personnel is likely to have very little negative impact on refuge wildlife populations and habitats. We anticipate research will only have negligible to minor impacts to refuge wildlife and habitats because it will only be carried out after the refuge approves a detailed project proposal and issues a SUP including the stipulations in this determination to ensure compatibility. These stipulations are designed to help ensure each project minimizes impacts to refuge cultural resources, wildlife, vegetation, soils, and water. We also anticipate only minimal impacts because Service staff will supervise this activity, and it will be conducted in accordance with refuge regulations. In the event of persistent disturbance to habitats or wildlife, the activity will be further restricted or discontinued. If the research project is conducted with professionalism and integrity, potential minor adverse impacts are likely to be outweighed by the body of knowledge contributed to our understanding of refuge resources and our management effects on those resources, as well as the opportunity to inform, strengthen, and improve future refuge management decisions.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 90 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Only low impact projects are covered under this determination. Low impact projects, as indicated under (a) above, are those that would only have a minimal potential to impact cultural resources and native wildlife and plants. No project should result in long-term negative alterations to species' behavior (e.g. result in wildlife leaving previously occupied areas for a long term; modifying their habitat use within their range; or, causing nest or young abandonment). No project should degrade wildlife habitat, including vegetation, soils, and water. Nest, dens, and burrows must not be harmed. No research activities should result in soil compaction or erosion, degrade water quality, remove or destroy vegetation, involve off-road vehicle use, or result in collection and removal of animals or whole native plants.
- Research would only be conducted in Service-approved locations, using approved modes of access, and conducted only after the timing, season, duration, numbers of researchers, and areas open and closed is approved. Sensitive wildlife habitat areas will be avoided unless sufficient protection, approved by the Service, is implemented to limit the area and/or resources potentially impacted by the proposed research.

- If a research project occurs during the refuge hunting season, special precautions will be required and enforced to ensure public health and safety, and otherwise reduce conflicts with other compatible refuge uses.

- The Service will require modifications to research activities, including temporarily closing areas, or changing methods, when warranted, to avoid harm to sensitive wildlife and habitat when unforeseen impacts arise.

- All researchers will be required to submit a detailed research proposal following the refuge's study proposal guidelines (Attachment 1) and Service Policy (FWS Refuge Manual Chapter 4 Section 6). The refuge must be given at least 45 days to review proposals before initiation of research. Proposals will include obligations for regular progress reports and a final summary document including all findings.

- The criteria for evaluating a research proposal, outlined in the "Description of Use" section (a) above, will be used when determining whether a proposed study will be approved on the refuge. Projects would be denied if they:

  * Negatively impact native fish, wildlife, and habitats or cultural, archaeological, or historical resources.

  * Detract from fulfilling the refuge's purposes or conflicts with refuge goals and objectives.

  * Cause public health or safety concerns.

  * Conflicts with other compatible refuge uses.

  * Are not manageable within the refuge's available staff or budget time.

- Proposals will be prioritized and approved based on need, benefit to refuge resources, and the level of refuge funding required. Service experts, State agencies, or academic experts may be asked to review and comment on proposals.

- If proposal is approved, a SUP will be issued. The SUP will contain this determination's stipulations as well as project-specific terms and conditions that the researcher(s) must follow relative to the activities planned (e.g., location, duration, seasonality, etc.).

- Researchers must comply with all state and Federal laws and follow all refuge rules and regulations. All necessary State and Federal permits must be obtained before starting research on the refuge (e.g., permits for capturing and banding birds). Any research involving federally listed species may require Section 7 consultation under the Endangered Species Act. Any research involving ground disturbance may require historic preservation consultation with the Regional Historic Preservation Officer and/or State Historic Preservation Officer.

- Researchers will mark any survey routes, plots, and points in as visually unobtrusive a manner as practical. No permanent markers or infrastructure can be left on the refuge.

- Researchers will use every precaution and not conduct activities that would cause damage to refuge property or present hazards or significant annoyances to other refuge visitors. Any damage should be reported immediately to the Refuge Manager

- Researchers must not litter, or start or use open fires on refuge lands.

- All research staff handling wildlife must be properly trained to minimize the potential for impacts to individual wildlife prior to initiating the project. In addition, a review of the U.S. Department of Agriculture's Animal Welfare Information Center website must be documented by the researcher with identification of practices that will be followed to help further minimize stress, injury, and mortality of wildlife. The website is reached at: *https://awic.nal.usda.gov/research-animals/wildlife-field-studies.*

- Researchers may not use any chemicals (e.g., herbicides to treat invasive plants) or hazardous materials without prior written consent of refuge manager (e.g., the type of chemical, timing of use, and rate of application). All activities will be consistent with Service policy and an approved refuge Pesticide Use Plan.

- Researchers will be required to take steps to ensure that invasive species and pathogens are not inadvertently introduced or transferred to the refuge and surrounding lands (e.g., cleaning equipment).

- Refuge staff will monitor research activities for potential impacts to the refuge. The refuge manager may determine that previously approved research and SUP be modified or terminated due to observed impacts that are more severe or extensive than originally anticipated. The refuge manager will also have the ability to cancel a SUP if the researcher is not in compliance with the stated conditions.

- Researchers must have the SUP in their possession when engaged in research activities and will present it to refuge officials and State and Federal law enforcement agents upon their request.

- Researchers will submit a final report to the refuge upon completion of their work. For long-term studies, interim progress reports may also be required. The refuge also expects that research findings will be published in peer-reviewed publications. The contribution of the refuge and the Service should be acknowledged in any publications. The SUP will identify a schedule for annual progress reports and the submission of a final report or scientific paper.

## JUSTIFICATION:

The Service encourages quality, scientific research because it provides critical baseline information on Federal trust and other refuge resources and helps evaluate the management effects on those resources. Conducting research is also one of the purposes for establishing Conte Refuge. Research results will also help inform, strengthen, and improve future refuge management decisions, as well as inform management decisions on other ownerships in the Connecticut River Watershed and possibly elsewhere in the Northeast Region. Given the stipulations above, and given that only low impact research projects would be conducted under this determination, we do not anticipate this activity will have greater than minor impact on refuge resources. Impacts, if they occur, would be confined in area, duration, and magnitude, with no long-term consequences predicted. Therefore, research conducted by non-Service personnel on Conte Refuge will not materially interfere with or detract from the mission of the Refuge System or the purposes for which the refuge was established.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

## LITERATURE CITED:

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Hammitt, W.E., and D.N. Cole. 1998. Wildlife Recreation: Ecology and Management (2nd edition). New York: John Wiley & Sons. 361p.

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# Attachment 1. Silvio O. Conte National Fish and Wildlife Refuge Study Proposal Guidelines

A study proposal is a justification and description of the work to be done, and includes cost and time requirements. Proposals must be specific enough to serve as "blueprints" for the investigative efforts. Step-by-step plans for the actual investigations must be spelled out in advance, with the level of detail commensurate with the cost and scope of the project and the needs of management. Please submit proposals electronically as a Microsoft Word document or hardcopy to the refuge manager.

The following list provides a general outline of first order headings/sections for study proposals.

- Cover Page.
- Table of Contents (for longer proposals).
- Abstract.
- Statement of Issue.
- Literature Summary.
- Objectives/Hypotheses.
- Study Area.
- Methods and Procedures.
- Quality Assurance/Quality Control.
- Specimen Collections.
- Deliverables.
- Special Requirements, Concerns, Necessary Permits.
- Literature Cited.
- Peer Review.
- Budget.
- Personnel and Qualifications.

## Cover Page

The cover page must contain the following information:

- Title of Proposal.
- Current Date.
- Investigator(s): name, title, organizational affiliation, address, telephone and fax numbers and e-mail address of all investigators or cooperators.
- Proposed starting date.
- Estimated completion date.
- Total Funding Support Requested from the U.S. Fish and Wildlife Service.
- Signatures of Principal Investigator(s) and other appropriate institutional officials.

## Abstract

The abstract should contain a short summary description of the proposed study, including reference to major points in the Statement of Issue, Objectives, and Methods and Procedures sections.

## Statement of Issue

Provide a clear, precise summary of the problem to be addressed and the need for its solution. This section should include statements of the importance, justification, relevance, timeliness, generality, and contribution of the study. Describe how any products will be used, including any anticipated commercial use. What is the estimated probability of success of accomplishing the objective(s) within the proposed timeframe?

## Literature Summary

This section should include a thorough but concise literature review of current and past research that pertains to the proposed research, especially any pertinent research conducted within the Connecticut River watershed, and specifically, on refuge units. A discussion of relevant legislation, policies, and refuge planning and management history, goals, and objectives should also be included.

## Objectives/Hypotheses

A very specific indication of the proposed outcomes of the project should be stated as objectives or hypotheses to be tested. Project objectives should be measurable. Provide a brief summary of what information will be provided at the end of the study and how it will be used in relation to the problem. These statements should flow logically from the statement of issue and directly address the management problem.

Establish data quality objectives in terms of precision, accuracy, representativeness, completeness, and comparability as a means of describing how good the data need to be to meet the project's objectives.

## Study Area

Provide a detailed description of the geographic area(s) to be studied and include a clear map delineating the proposed study area(s) and showing specific locations where work will occur.

## Methods and Procedures

This section should describe as precisely as possible how the objectives will be met or how the hypotheses will be tested. Include detailed descriptions and justifications of the field and laboratory methodology, protocols, and instrumentation. Explain how each variable to be measured directly addresses the research objective/hypothesis. Describe the experimental design, population, sample size, and sampling approach (including procedures for sub-sampling). Summarize the statistical and other data analysis procedures to be used. List the response variables and tentative independent variables or covariates. Describe the experimental unit(s) for statistical analysis. Also include a detailed project time schedule that includes initiation, fieldwork, analysis, reporting, and completion dates.

## Quality Assurance/Quality Control

Adequate quality assurance/quality control (QA/QC) procedures help insure that data and results are: credible and not an artifact of sampling or recording errors; of known quality; able to stand up to external scientific scrutiny; and accompanied by detailed method documentation. Describe the procedures to be used to insure that data meet defined standards of quality and program requirements, errors are controlled in the field, laboratory, and office, and data are properly handled, documented, and archived. Describe the various steps (e.g., personnel training, calibration of equipment, data verification and validation) that will be used to identify and eliminate errors introduced during data collection (including observer bias), handling, and computer entry. Identify the percentage of data that will be checked at each step.

## Specimen Collections

Clearly describe the kind (species), numbers, sizes, and locations of animals, plants, rocks, minerals, or other natural objects to be sampled, captured, or collected. Identify the reasons for collecting, the intended use of all the specimens to be collected, and the proposed disposition of collected specimens. For those specimens to be permanently retained as voucher specimens, identify the parties responsible for cataloging, preservation, and storage and the proposed repository.

## Deliverables

The proposal must indicate the number and specific format of hard and/or electronic media copies to be submitted for each deliverable. The number and format will reflect the needs of the refuge and the Refuge manager. Indicate how many months after the project is initiated (or the actual anticipated date) that each deliverable will be submitted. Deliverables are to be submitted or presented to the refuge manager.

Deliverables that are required are as follows:

### *Reports and Publications*

Describe what reports will be prepared and the timing of reports. Types of reports required in fulfillment of natural and social science study contracts or agreements include:

(1) Progress report(s) (usually quarterly, semiannually, or annually): may be required
(2) Draft final and final report(s): always required

A final report must be submitted in addition to a thesis or dissertation (if applicable) and all other identified deliverables. Final and draft final reports should follow refuge guidelines (Attachment 1a).

In addition, investigators are encouraged to publish the findings of their investigations in refereed professional, scientific publications and present findings at conferences and symposia. The Refuge manager appreciates opportunities to review manuscripts in advance of publication.

### *Data Files*

Provide descriptions of any spatial (Geographic Information Systems; GIS) and non-spatial data files that will be generated and submitted as part of the research. Non-spatial data must be entered onto Windows CD ROMs in Access or Excel. Spatial data, which includes GPS (Global Position System)-generated files, must be in a format compatible with the refuge's GIS system (ArcGIS 8 or 9, Arcview 3.3, or e00 format). All GIS data must be in UTM 19, NAD 83.

### *Metadata*

For all non-spatial and spatial data sets or information products, documentation of information (metadata) describing the extent of data coverage and scale, the history of where, when, and why the data were collected, who collected the data, the methods used to collect, process, or modify/ transform the data, and a complete data dictionary must also be provided as final deliverables. Spatial metadata must conform to U.S. Fish and Wildlife Service (Federal Geographic Data Committee; FDGC) metadata standards.

### *Oral Presentations*

Three types of oral briefings should be included: pre-study, annual, and closeout.

These briefings will be presented to refuge staff and other appropriate individuals and cooperators. In addition, investigators should conduct periodic informal briefings with refuge staff throughout the study whenever an opportunity arises. During each refuge visit, researchers should provide verbal updates on project progress. Frequent dialogue between researchers and refuge staff is an essential element of a successful research project.

### *Specimens and Associated Project Documentation*

A report on collection activities, specimen disposition, and the data derived from collections, must be submitted to the refuge following refuge guidelines.

### *Other:*

Researchers must provide the refuge manager with all of the following:

(1) Copies of field notes/ notebooks/ datasheets.

(2) Copies of raw data (in digital format), including GIS data, as well as analyzed data.

(3) Copies of all photos, slides (digital photos preferred), videos, and films.

(4) Copies of any reports, theses, dissertations, publications or other material (such as news articles). resulting from studies conducted on refuge.

(5) Detailed protocols used in study.

(6) Aerial photographs.

(7) Maps.

(8) Interpretive brochures and exhibits.

(9) Training sessions (where appropriate).

(10) Survey forms.

(11) Value-added software, software developed, and models.

Additional deliverables may be required of specific studies.

## Special Requirements, Permits, and Concerns

Provide information on the following topics where applicable. Attach copies of any supporting documentation that will facilitate processing of your application.

### *Refuge Assistance*

Describe any refuge assistance needed to complete the proposed study, such as use of equipment or facilities or assistance from refuge staff. It is important that all equipment, facilities, services, and logistical assistance expected to be provided by the Fish and Wildlife Service be specifically identified in this section so all parties are in clear agreement before the study begins.

### *Ground Disturbance*

Describe the type, location, area, depth, number, and distribution of expected ground- disturbing activities, such as soil pits, cores, or stakes. Describe plans for site restoration of significantly affected areas.

Proposals that entail ground disturbance may require an archeological survey and special clearance prior to approval of the study. You can help reduce the extra time that may be required to process such a proposal by including identification of each ground disturbance area on a U.S. Geological Survey (USGS) 7.5-minute topographic map.

### *Site Marking and/or Animal Marking*

Identify the type, amount, color, size, and placement of any flagging, tags, or other markers needed for site or individual resource (e.g., trees) identification and location. Identify the length of time it is needed and who will be responsible for removing it. Identify the type, color, placement of any tags placed on animals (see SUP for requirements on marking and handling of animals).

### *Access to Study Sites*

Describe the proposed method and frequency of travel to and within the study site(s). Explain any need to enter restricted areas. Describe duration, location, and number of participants, and approximate dates of site visits.

### *Use of Mechanized and Other Equipment*

Describe any vehicles, boats, field equipment, markers, or supply caches by type, number, and location. You should explain the need to use these materials and if or how long they are to be left in the field.

### *Safety*

Describe any known potentially hazardous activities, such as electro-fishing, scuba diving, whitewater boating, aircraft use, wilderness travel, wildlife capture or handling, wildlife or immobilization.

### *Chemical Use*

Identify chemicals and hazardous materials that you propose using within the refuge.

Indicate the purpose, method of application, and amount to be used. Describe plans for storage, transfer, and disposal of these materials and describe steps to remediate accidental releases into the environment. Attach copies of Material Safety Data Sheets.

### *Animal Welfare*

If the study involves vertebrate animals, describe your protocol for any capture, holding, marking, tagging, tissue sampling, or other handling of these animals (including the training and qualifications of personnel relevant to animal handling and care). If your institutional animal welfare committee has reviewed your proposal, please include a photocopy of their recommendations. Describe alternatives considered, and outline procedures to be used to alleviate pain or distress. Include contingency plans to be implemented in the event of accidental injury to or death of the animal. Include state and Federal permits. Where appropriate, coordinate with and inform state natural resource agencies.

## Literature Cited

List all reports and publications cited in the proposal.

## Peer Review

Provide the names, titles, addresses, and telephone numbers of individuals with subject-area expertise who have reviewed the research proposal. If the reviewers are associated with the investigator's research institution or if the proposal was not reviewed, please provide the names, titles, addresses, and telephone numbers of three to five potential subject-area reviewers who are not associated with the investigator's institution. These individuals will be asked to provide reviews of the proposal, progress reports, and the draft final report.

## Budget

The budget must reflect both funding and assistance that will be requested from the Fish and Wildlife Service and the cooperator's contributions on an identified periodic (usually annual) basis.

### *Personnel Costs*

Identify salary charges for principal investigator(s), research assistant(s), technician(s), clerical support, and others. Indicate period of involvement (hours or months) and pay rate charged for services. Be sure to include adequate time for data analysis and report writing and editing.

### *Fringe Benefits*

Itemize fringe benefit rates and costs.

### *Travel*

Provide separate estimates for fieldwork and meetings. Indicate number of trips, destinations, estimated miles of travel, mileage rate, air fares, days on travel, and daily lodging and meals charges. Vehicle mileage rate cannot exceed standard government mileage rates. Charges for lodging and meals are not to exceed the maximum daily rates set for the locality by the Federal Government.

### *Equipment*

Itemize all equipment to be purchased or rented and provide a brief justification for each item costing more than $1,000. Be sure to include any computer-related costs. For proposals funded under Service agreement or contract, the refuge reserves the right to transfer the title of purchased equipment with unit cost of $1,000 or more to the Federal Government following completion of the study. These items should be included as deliverables.

### *Supplies and Materials*

Purchases and rentals under $1,000 should be itemized as much as is reasonable.

### *Subcontract or Consultant Charges*

All such work must be supported by a subcontractor's proposal also in accordance with these guidelines.

### *Specimen Collections*

Identify funding requirements for the cataloging, preservation, storage, and analyses of any collected specimens that will be permanently retained.

### *Printing and Copying*

Include costs for preparing and printing the required number of copies of progress reports, the draft final report, and the final report. In general, a minimum of two (2) copies of progress reports (usually due quarterly, semiannually, or as specified in agreement), the draft final report, and the final report are required.

### *Indirect Charges*

Identify the indirect cost (overhead) rate and charges and the budget items to which the rate is applicable.

### *Cooperator's Contributions*

Show any contributing share of direct or indirect costs, facilities, and equipment by the cooperating research institution.

### *Outside Funding*

List any outside funding sources and amounts.

## Personnel and Qualifications

List the personnel who will work on the project and indicate their qualifications, experience, and pertinent publications. Identify the responsibilities of each individual and the amount of time each will devote. A full vita or resume for each principal investigator and any consultants should be included here.

# Attachment 1a. Interim Final Report Guidelines

Draft final and final reports should follow Journal of Wildlife Management format and should include the following sections:

Title Page
Abstract
Introduction/Problem statement
Study Area
Methods (including statistical analyses)
Results
Discussion
Management Implications
Management Recommendations
Literature Cited

**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Recreational Gathering of Blueberries, Blackberries, Strawberries, Raspberries, Mushrooms, Fiddleheads, and Antler Sheds

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Recreational Gathering of Blueberries, Blackberries, Strawberries, Raspberries, Mushrooms, Fiddleheads, and Antler Sheds

## NARRATIVE:

Federal regulations (50 CFR 27.51(a) and 27.21) prohibit the destruction or collection of plants and the taking of plants or animals (except as allowed by regulated hunting) on national wildlife refuges. However, picking and gathering blueberries, raspberries, blackberries, and mushrooms involves the removal of fruiting bodies only and does not harm the plants, which are left in place. Similarly, the removal of fiddleheads involves removing only some of the fronds as they sprout, similar to harvesting asparagus. Again, the plant itself is not destroyed or collected. Antler sheds are a discarded animal part; collecting these does not harm the deer or moose that have shed them. This use specifically does not include recreational gathering of cranberries since they occur in wetlands due to potential impacts to wetland vegetation (our highest priority habitat).

The gathering of berries, mushrooms, fiddleheads, and antler sheds are historic uses of Silvio O. Conte National Fish and Wildlife Refuge (refuge) and have occurred continuously on refuge lands for decades. These uses are not priority public uses of the National Wildlife Refuge System (Refuge System), as defined by the Refuge System Improvement Act of 1997 (Public Law 105-57). However, the gathering of these materials can foster a connection to, and appreciation for, the area's natural resources, and they often occur concurrently with other public uses, including priority public uses. Current levels of these uses are low and we are not aware of any conflicts with other public uses or negative effects on refuge resources from these uses. This use only allows the collection of parts of plants and animals, such as berries and antler sheds, and not the collection of entire plants or wildlife.

We have determined that continuing to allow these uses is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILITY DETERMINATION

## USE:

Recreational Gathering of Blueberries, Blackberries, Strawberries, Raspberries, Mushrooms, Fiddleheads, and Antler Sheds

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is it a priority public use?**
The use is recreational gathering of blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds. This use specifically does not include recreational gathering of cranberries since they occur in wetlands due to potential impacts to wetland vegetation (our highest priority habitat). The berries, mushrooms, fiddleheads, and antlers collect must be for personal use only, and not for commercial

sale. It is not a priority public use of the National Wildlife Refuge System (Refuge System), under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997.

**(b) Where would the use be conducted?**
These activities would take place on all refuge divisions open to public uses, including lands acquired in the future pursuant to the final comprehensive conservation plan (e.g., McConnell Pond tract at Nulhegan Basin Division, or any of the conservation focus areas).

**(c) When would the use be conducted?**
Visitors may collect these materials whenever they are seasonally available. All refuge units are open to this use daily from one-half hour before sunrise to one-half hour after sunset, with the following exceptions:

- The Third Island Unit (Deerfield, MA) is seasonally closed (January 1 through July 31) to protect nesting bald eagles.
- Both the Dead Man's Swamp (Cromwell, CT) and the Wissatinnewag Units (Greenfield, MA) are closed to the public at all times to protect sensitive resources.
- The Mount Tom Unit (Holyoke, MA) is currently closed due to public safety and vandalism concerns.

**(d) How would the use be conducted?**
We are proposing to open refuge lands to recreational gathering of natural materials for personal use. The gathering of these materials is a use of the area and fosters a connection to, and appreciation for, the area's natural resources. We recognize that picking and gathering blueberries, blackberries, strawberries, raspberries, mushrooms, fiddleheads, and antler sheds has occurred on the refuge for many years. Current levels of this use are low and this use often occurs concurrently with other public uses, including priority public uses.

Natural materials gathered on the refuge are for private use only; the exact quantities are described below under "Stipulations Necessary to Ensure Compatibility." Any sale of these materials would be considered a commercial use of these materials and is prohibited by Federal law. This use specifically does not include recreational gathering of cranberries because they occur in wetlands and their harvesting poses potential impacts to wetland vegetation (our highest priority habitat).

At the discretion of the refuge manager, some areas may be seasonally, temporarily, or permanently closed to gathering of natural materials if wildlife or habitat impacts, or if user conflicts become an issue. Furthermore, the refuge manager may modify daily and yearly limits of natural materials to be collected. No plants may be introduced or transplanted on refuge lands to promote recreational gathering of berries and no whole plants are to be removed from the refuge.

**(e) Why is this use being proposed?**
The use is being proposed by the refuge to accommodate a requested use of the area. Gathering of these natural materials has occurred in the area for many years.

## AVAILABILITY OF RESOURCES:

The resources necessary to provide and administer this use are available within current and anticipated refuge budgets. Staff time associated with the administration of this use is primarily related to answering general questions from the public and monitoring impacts of the use on refuge resources. This activity is administered by the refuge staff who assess interactions among user groups and any related user impacts. Resource impacts will be monitored by refuge staff, under the supervision of the Refuge Manager. The use of refuge staff to monitor the impacts of public uses on refuge resources, and visitors is required for administering all refuge public uses. Therefore, these responsibilities and related equipment are accounted for in budget and staffing plans.

We estimate below the annual costs associated with the administration of this use.

| | |
|---|---|
| *Supplies and materials:* (This includes in-house brochure production) | $300 |
| *Monitoring resource impacts:* | $1,400 |
| *Law enforcement:* | $2,000 |
| **Total Annual Cost of Program:** | **$3,700** |

We do not anticipate charging fees for this use.

## ANTICIPATED IMPACTS OF THE USE:

The gathering of natural materials would have impacts to refuge resources that are similar to those discussed in the compatibility determination for wildlife observation, photography, environmental education, and interpretation. In general, visitors engaged in these uses would be traveling by foot, either by walking or hiking, in designated areas and along designated trails and roads. Visitors would likely engage in gathering natural resources while participating in priority public uses on the refuge. Engaging in priority public uses provides visitors with a better appreciation for and more complete understanding of the wildlife and habitats associated with the refuge. This can translate into more widespread and stronger support for the refuge, the Refuge System, and the U.S. Fish and Wildlife Service (Service), as well as wildlife conservation in general.

The negative impacts of this use include impacts to plants, soils, hydrology, and wildlife from visitors walking and hiking on the refuge, we have described these impacts below; however, because most visitors gathering natural materials are also participating in other compatible public uses, we do not expect pedestrian impacts associated with this use to be additive.

### Vegetation Impacts:

Pedestrian travel can have indirect impacts to plants by compacting soils and diminishing soil porosity, aeration, and nutrient availability that affect plant growth and survival (Kuss 1986). Hammitt and Cole (1998) note that compaction limits the ability of plants to re-vegetate affected areas. Repeated foot travel can directly impact plants by crushing the plants themselves. Rare plants with limited site occurrence are particularly susceptible to such impacts. Plants growing in wet or moist soils are the most sensitive to disturbance from trampling effects (Kuss 1986). Moist and wet soil conditions are present at the refuge, particularly during spring and early summer. To minimize impacts to sensitive wetland plants, we would not allow the gathering of cranberries and discourage visitors from walking through wetland areas.

It is anticipated that allowing this use would cause vegetation loss on designated routes. Foot travel may increase root exposure and trampling effects; however, it is anticipated that under current levels of use the incidence of these problems would be minor. Designated routes for pedestrian travel consist of existing trails, many with hardened surfaces or are existing trails that have been used for many years. Designated routes do not have any known occurrences of rare plant species on their surface that would be impacted by this use. Continuing pedestrian travel on these routes is not likely to cause any significant impacts to plants or plant communities. There may also be limited amounts off-trail pedestrian use associated with recreational gathering. However, we do not anticipate that impacts to vegetation from off-trail use would be greater than negligible because it would be dispersed and occur at low levels. We also encourage visitors to stay on designated roads and trails, and expect most recreational gathering will occur nearby to trails and roads.

People can be vectors for invasive plants when seeds or other propagules are moved from one area to another. Once established, invasives can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. The threat of invasive plant establishment would always be an issue requiring annual monitoring, and when necessary, treatment. Staff would work to educate the visiting public to reduce introductions and would also monitor and control invasives plants and other species.

### Soils Impacts:

Soils can be compacted and eroded as a result of continued use of pedestrian routes (Cole and Landres 1995). It is anticipated that some soil erosion would occur as a result of continuing pedestrian access on designated

routes and some limited off-trail use. Under current and anticipated levels of use, impacts to soils (erosion, compaction) are not likely to be significant.

## Hydrologic Impacts:

Roads and trails can affect the hydrology of an area, primarily through alteration of drainage patterns. It is anticipated that existing roads and trails would continue to influence hydrology regardless of pedestrian travel. Maintenance would be required to create adequate and proper drainage to avoid hydrologic impacts. Trail construction may also cause erosion and run-off of sediment into nearby waterways from exposed soils. To minimize these impacts, we would properly site trails, encourage visitors to stay on designated roads and trails, and discourage visitors from walking through sensitive wetland areas.

## Wildlife Impacts:

Disturbances vary with the wildlife species involved and the type, level, frequency, duration and the time of year such activities occur. The responses of wildlife to human activities includes: avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993, Whittaker and Knight 1998), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior or habituation to human disturbance (Burger 1981, Korschen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), attraction (Whittaker and Knight 1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Knight and Cole (1991) suggest recreational activities occurring simultaneously may have a combined negative impact on wildlife. Hammitt and Cole (1998) conclude that the frequent presence of humans in wildland areas can dramatically change the normal behavior of wildlife mostly through "unintentional harassment." These responses can have negative impacts to wildlife such as mammals becoming habituated to humans making them easier targets for hunters. Human induced avoidance by wildlife can prevent animals from using otherwise suitable habitat.

Seasonal sensitivities can compound the effect of disturbance on wildlife. Examples include regularly flushing birds during nesting or causing mammals to flee during winter months, thereby consuming large amounts of stored fat reserves. Hammitt and Cole (1998) noted that females with young (such as white-tailed deer) are more likely to flee from a disturbance than those without young. Some uses, such as bird observation, are directly focused on viewing certain wildlife species and can cause more significant impacts during the breeding season and winter months.

Trails can disturb wildlife outside the immediate trail corridor (Trails and Wildlife Task Force 1998, Miller et al. 2001). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. Bird communities in this study were apparently affected by the presence of recreational trails, where "generalists" (e.g., American robins (*Turdus migratorius*)) were found near trails and "specialist" species (e.g., grasshopper sparrows (*Ammodramus savannarum*)) were found farther from trails. Nest predation was also found to be greater near trails (Miller et al. 1998).

Visitors engaged in this use have the potential to impact shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails during certain times of the year. Human disturbance to migratory birds has been documented in many studies in different locations. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. Flight in response to disturbance can lower nesting productivity and cause disease and death.

Studying the effects of human visitation on waterbirds at J.N. "Ding" Darling Refuge, Klein (1989) found resident waterbirds to be less sensitive to disturbance than migrants; she also found that sensitivity varied according to species and individuals within species. Herons and bitterns were quite tolerant of people; however, the presence of people did disturb these birds when hunting terrestrial prey. Great blue herons (*Ardea herodias*), tricolored herons (*Egretta tricolor*), great egrets (*Casmerodius albus*), and little blue herons (*E. caerulea*) were disturbed to the point of flight more than other birds. Kushlan (1978) found that the need of these birds to move frequently while feeding may disrupt interspecific and intraspecific relationships. In addition, Batten (1977) and Burger (1981) found that wading birds were extremely sensitive to disturbance in the Northeastern United States.

Klein (1993), in studying waterbird response to human disturbance, found that as intensity of disturbance increased, avoidance response by the birds increased and that out-of-vehicle activity to be more disruptive than vehicular traffic; Freddy et al. (1986) and Vaske et al. (1983) also found the latter to be true. In regards to waterfowl, Klein (1989) found migratory dabbling ducks to be the most sensitive to disturbance and migrant ducks to be more sensitive when they first arrived in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species.

For songbirds, Gutzwiller et al. (1994) found that singing behavior of some species was altered by low levels of human intrusion. Some studies have found that some bird species habituate to repeated intrusion; frequently disturbed individuals of some species have been found to vocalize more aggressively, have higher body masses, or tend to remain in place longer (Cairns and McLaren 1980). Disturbance may affect the reproductive fitness of males by hampering territory defense, male attraction, and other reproductive functions of song (Arcese 1987). Disturbance, which leads to reduced singing activity, would make males rely more heavily on physical deterrents in defending territories which are time and energy consuming (Ewald and Carpenter 1978).

Several studies have examined the effects of recreationists on birds using shallow-water habitats adjacent to trails and roads in the Eastern United States (Burger 1981, Burger 1986, Klein 1993, Burger et al. 1995, Klein et al. 1995, Rodgers and Smith 1995, 1997, Burger and Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986, Klein 1993, Burger et al. 1995, Klein et al. 1995, Rodgers and Smith 1997, Burger and Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

***Presence:*** Birds avoided places where people were present and when visitor activity was high (Burger 1981, Klein et al. 1995, Burger and Gochfeld 1998).

***Distance:*** Disturbance increased with decreased distance between visitors and species (Burger 1986), though exact measurements were not reported.

***Approach Angle:*** Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger and Gochfeld 1981, Burger et al. 1995, Knight and Cole 1995, Rodgers and Smith 1995, 1997).

***Type and Speed of Activity:*** Joggers and landscapers caused birds to flush more than fishermen, clammers, sunbathers, and some pedestrians, possibly because the former groups move quickly (joggers) or create more noise (landscapers). The latter groups tend to move more slowly or stay in one place for longer periods, and thus birds likely perceive these activities as less threatening (Burger 1981, 1986, Burger et al. 1995, Knight and Cole 1995). Alternatively, birds may tolerate passing by with unabated speed whereas if the activity stops or slacks birds may flush (Burger et al. 1995).

***Noise:*** Noise caused by visitors resulted in increased levels of disturbance (Burger 1986, Klein 1993, Burger and Gochfeld 1998), though noise was not correlated with visitor group size (Burger and Gochfeld 1998).

There are several known federally listed threatened or endangered species occurring on refuge lands or lands proposed for refuge acquisition. Where necessary, we will close sensitive areas to protect these species. For example, the Dead Man's Swamp Unit is closed to protect the federally listed puritan tiger beetle. Therefore, this activity is not expected to affect any threatened or endangered species. Disturbance to other species is expected to be negligible. Trail use may discourage use of habitat by nesting birds very close to the trails, but the area impacted by trails is small compared to the area available to wildlife away from any trail. Although some off-trail use occurs on the refuge, visitors are encouraged to stay on designated trails and roads.

## PUBLIC REVIEW AND COMMENT:

As part of the Comprehensive Conservation Plan (CCP) planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- The daily limit of blueberries, blackberries, raspberries, and strawberries shall be 1 quart per person per day.
- The daily limit of fiddleheads and mushrooms shall be one-half pound (8 ounces) per person per day.
- The annual limit of antlers shall be one pair of deer antlers and one pair of moose antlers per person (a pair includes: a matching pair; an unmatched right-left pair; two right antlers, or two left antlers).
- No whole plants will be collected or removed from the refuge.
- Ground disturbance will be minimized in the collection of mushrooms; only above-ground parts may be removed.
- A Federal wildlife officer will help to promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions.
- Recreational gathering of cranberries will not be allowed due to potential impacts to wetland vegetation.

## JUSTIFICATION:

Harvest of these natural materials within the Conte Refuge will not materially interfere with or detract from the mission of the Refuge System or the purposes for which the refuge was established. Providing the opportunity for recreational gathering of natural materials on the refuge provides visitors with an opportunity to observe wildlife and to view Service wildlife habitat management projects. Also, we do not anticipate any greater than negligible impacts to refuge resources from this use.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Snowmobiling on Designated Snowmobile Trails on the Dead Branch Division

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Snowmobiling on Designated Snowmobile Trails on the Dead Branch Division

## NARRATIVE:

The Commonwealth of Massachusetts has over 2,000 miles of snowmobile trails (Snowmobile Association of Massachusetts, undated). The 0.2 miles of snowmobile trail on the Dead Branch Division is part of a larger trail network in the area that connects trails in Williamsburg with trails in the Berkshires. Snowmobile recreation is a popular winter activity in Massachusetts and it provides access to the refuge and can provide an opportunity for visitors to be introduced to the refuge. The best way to engage visitors on this short section of trail will be to install boundary signs at both entrance points and construct an informational kiosk near the southern boundary.

The primary reason for retaining the existing trail is for snowmobiles to avoid wet areas off the division and to use an existing snowmobile bridge over the Dead Branch that has been in place for many years. The route for this trail (State Corridor Trail 93) is in an abandoned utility corridor that extends nearly 7 miles starting in Williamsburg. Both this corridor, and the trail proper, lie just south of the division boundary. However, early in the snowmobile season when there is sufficient snow cover to open the trail elsewhere, the section just south of the division is unsuitable because the saturated soils have not yet frozen and the Dead Branch is unsafe to cross. During this period, the historical route on the division offers a safe and environmentally sound alternative to the main trail. This trail is used less once the ground and stream are frozen, but it used throughout the snowmobile season by some.

The use does not interfere with the refuge's conservation goals and objectives, because impacts to trust resources during winter are minimized when the ground is frozen and covered with snow and fewer species and fewer numbers of wildlife are present. Key winter habitat for most resident wildlife such as big game and gallinaceous birds (e.g., species of grouse) would be minimally affected by snowmobile presence on the short section of trail on the refuge. Because this sort section of trail lies within the former Berkshire Hardwoods wood mill site and there is limited to no thermal cover, little impact to resident winter wildlife is anticipated.

This use may also contribute to public understanding of, and appreciation for, the refuge's natural resources by providing opportunities for participants to experience the refuge, see refuge habitats, and support wildlife-dependent recreation during winter when access to the majority of the refuge is otherwise limited.

We anticipate that noise from use of this trail may be an annoyance to other visitors. However, the trail on the division is a small link in the larger state trail network and snowmobile noise will continue to be present, as it has for several decades, whether or not the division trail is open because most of the trail is on private property. Although snowmobiles emit exhaust and can have loud engines, the Commonwealth of Massachusetts (undated) requires that no snowmobiles be operated which emit noxious fumes or produce a sound pressure level of more than 96 decibels using test procedures established by the Society of Automotive Engineers under Standard J1287 JUL98 or other test procedures adopted by the State. Also, the level of pedestrian use on the refuge is relatively limited because this division was newly created in 2011 and there is no other visitor infrastructure.

For these reasons, we have determined that continuing to allow this use is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

## LITERATURE CITED

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# COMPATIBILITY DETERMINATION

## USE:

Snowmobiling on Designated Snowmobile Trails on the Dead Branch Division

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority public use?**
Public snowmobile access is the use considered in this Compatibility Determination. This is not a priority public use of the National Wildlife Refuge System (Refuge System), under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997. This compatibility determination pertains only to non-commercial, public snowmobile access on the Dead Branch Division; commercial snowmobile tours are a different use that would need to be considered separately.

**(b) Where would the use be conducted?**
Massachusetts has more than 2,000 miles of snowmobile trails. The Dead Branch Division included approximately 0.2 miles of snowmobile trail through the former Berkshire Hardwoods mill site (see map D.4). This trail is part of a larger network that connects the Williamsburg area to trails in the Berkshires. The U.S. Fish and Wildlife Service (Service) owns this land in fee.

Assuming a 12-foot wide trail, approximately 0.3 acres or 0.03 percent of the division landbase is directly impacted by the active snowmobile trail. The snowmobile trail is located in mixed hardwood habitat within 300 feet of log landings of the former mill site. A limited number of migratory bird species are affected because most move to their wintering areas prior to snowmobile season. Some species such as black-capped chickadees, downy woodpeckers, ruffed grouse, white-tailed deer, and other forest species that overwinter may be affected by snowmobile presence. Black bears, reptiles, amphibians, bats, beavers, and fish may be found in the vicinity, but typically these species are inactive or under ice during the snowmobile season. No federally listed species are known to occur at the Dead Branch Division.

**(c) When would the use be conducted?**
Snowmobile use on the refuge would begin no earlier than December 1 and end no later than April 30. This minimizes conflicts with migratory and hibernating wildlife, and soil disturbance since snow cover is a prerequisite to opening the trail. Snowmobile access and trail grooming will be allowed during daytime and nighttime hours. General trail maintenance activities such as brush cutting and down tree removal also may be performed occasionally during the late summer and fall.

**(d) How would the use be conducted?**
Snowmobilers at the Dead Branch Division must comply with Massachusetts General Law Part I, Title XIV, Chapter 90B *Motorboats, other vessels, and recreational vehicles* which includes provisions for annual registration, manufacturing specifications, and rules for lawful operation (Commonwealth of Massachusetts Undated a). Individual snowmobile operators are required to obtain permission to use public lands, unless they are on a trail marked and designated for use by snowmobiles (Commonwealth of Massachusetts Undated b).

In Massachusetts, snowmobiles must be registered for a 2-year period with the Massachusetts Boat, Recreation Vehicle, and Snowmobile Registration Bureau unless they are exclusively used for agricultural, forestry, lumbering, or construction purposes (Commonwealth of Massachusetts Undated a). Snowmobilers that ride on Snowmobile Association of Massachusetts (SAM) club trails across private property must be a SAM member or have written permission of each landowner (Commonwealth of Massachusetts Undated c). SAM uses these funds for a variety of related purposes including liability insurance and trail maintenance. A portion of the registration fees also support Massachusetts Environmental Police Officers engaged in snowmobile enforcement.

Snowmobile access and use on the Dead Branch Division also will comply with applicable federal regulations (50 CFR 27.31), and executive orders (11644 *Use of Off-Road vehicles on the Public Lands,* February 8, 1972; and, 11989 *Off-Road Vehicles on Public Lands,* May 24, 1977). An annual special use permit (SUP) will be issued to the local snowmobile club affiliated with SAM for the purpose of authorizing snowmobile use, trail maintenance, and grooming on the Dead Branch Division. One stipulation of this permit is that SAM must carry general liability insurance for the snowmobile club.

The snowmobile club will be responsible for funding and carrying out maintenance and infrastructure repair to maintain a safe snowmobile trail on the Division. They will install signage (e.g. trail number and speed limit) authorized by the Refuge Manager before the trail opens in winter, maintain those signs throughout the snowmobile season, and remove them when the season ends. The local club also is responsible for grooming the trail on the division throughout the snowmobile season. Grooming will generally be done at night with the frequency dependent on snow and trail conditions. During the late summer or fall, with prior approval in writing by the Refuge Manager, the club may prepare the trail for the upcoming season by cutting back woody vegetation and removing trees that have fallen across the trail. Under the permit, club members may use all-terrain vehicles solely to access the trail for maintenance and sign activities during the late summer or fall; however, they must secure permission by notifying the Refuge Manager at least 48 hours in advance.

*Map D.4. Snowmobile Trail at Dead Branch Division.*

We will allow snowmobiling generally following MassWildlife snowmobiling guidelines, where otherwise compatible and consistent with applicable Service laws, policy and guidelines. The refuge manager will continue to meet with the club at least annually to discuss and reach agreement on planned activities and to review SUP stipulations and conditions. Because clubs must secure landowner permission for construction and maintenance grants, the annual meeting also will serve to identify any up-front requirements for work on the Division (e.g. compliance with the National Environmental Policy Act).

There is a 0.2-mile section of snowmobile trail within the division boundary that was in existence prior to Service ownership. This trail enters the Division from the North on the current western boundary, crosses the Dead Branch and exists on the southern boundary. Historically, this trail crossed a larger section of the former Berkshire Hardwoods mill site; however, it was shortened and rerouted to avoid the log landings (personal communication, Jeff Poirier Berkshire Hardwoods).

According to SUP conditions, the snowmobile trail will not open prior to December 1 and will close on or before April 30, each year. The actual length of the season will be dependent on having enough snow cover to protect underlying soils and vegetation.

Snowmobile operation must be reasonable and prudent as described in Federal regulations (50 CFR 27.31) and State regulations (323 CMR 3.03:4).

**(e) Why is this use being proposed?**
As previously stated, the snowmobile trail within the refuge boundary was in existence prior to Service purchase. This section is part of a larger trail network that links the Williamsburg vicinity with the Berkshires. The trail section on the division has been in existence for many years (personal communication, Jeff Poirier Berkshire Hardwoods). Mr. Poirier has been satisfied with the snowmobile club partnership and the trail riders.

The primary reason for retaining the existing trail is for snowmobiles to avoid wet areas off the division prior to the hard freeze and to use an existing snowmobile bridge over the Dead Branch that has been in place for many years. The route for this trail (State Corridor Trail 93) is in an abandoned utility corridor that extends nearly 7 miles starting from the town of Williamsburg. This corridor and the trail proper lie just south of the division boundary. However, early in the snowmobile season when there is sufficient snow cover to open the trail elsewhere, the section just south of the division is unsuitable because the saturated soils have not yet frozen and the Dead Branch is unsafe to cross. During this period, the historical route on the Division offers a safe and environmentally sound alternative to the main trail. This trail is used less once the ground and stream are frozen, but it used throughout the snowmobile season by some.

The majority of migratory birds found on the division are breeders or migrants that move south to more temperate climates during the winter. Snowmobiling at the Dead Branch Division would be inconsequential to these species because there is no temporal overlap in use and habitat composition and structure would not be altered. Some species, such as chickadees, downy woodpeckers, and nuthatches remain in the area yearlong and would be affected to some degree by snowmobile use. However, the short section of trail does not intersect unique habitat and individual birds affected by snowmobiles have ample suitable habitat to avoid disturbance.

Key winter habitat for most resident wildlife such as big game, gallinaceous birds (e.g. grouse) would be minimally affected by snowmobile presence. Winter thermal cover for many species in this part of Western Massachusetts is composed of dense conifers, rhododendrons, or mountain laurels (Massachusetts Department of Fish and Game Undated). Because this trail is short and does not intersect key winter range habitat, little impact to resident winter wildlife is anticipated.

There are benefits of allowing snowmobile use of the trail across the division. From the snowmobile club perspective closure of this trail would create a gap in a historically popular trail during the early part of the season. The necessary rerouting to avoid the wet areas south of the division and construction of another bridge would in all likelihood entail new road crossings and trail and bridge construction on private lands, if permission could be secured. It would also be longer than the current route. Moving this trail would result in alteration of habitats not currently impacted and be a significant expense. The current trail location has minimal effect on habitat composition and structure because of its limited length.

One means of reaching snowmobilers is via an informational kiosk on the south end of the trail where snowmobilers can stop and view information. We would work in cooperation with the other conservation partners (i.e. SAM, local snowmobile club, and the Department of Fish and Game) to construct an informational kiosk along the trail if use levels warrant. This would give us and partners an opportunity to connect with riders through interpretive displays, brochures, fact sheets, and other pertinent information that will increase their understanding of the importance of this refuge and how it fits into the larger conservation efforts of the Service.

An unknown number of snowmobilers that enter the division engage in one or more priority public uses, particularly wildlife observation and photography. Moose, deer, and coyotes are active at the Dead Branch Division in winter and seeing them during a warm day would not be unusual. However, because the trail on the division is so short (0.2 miles) and lies within a forest without vistas, most snowmobilers are likely passing through to another destination. Today, most snowmobilers probably do not even know they are on a national wildlife refuge; however, continued use of this existing trail through the division has the potential to cultivate support from a non-traditional public sector and give them an appreciation of the conservation importance of the Dead Branch Division.

## AVAILABILITY OF RESOURCES:

Sufficient Refuge resources in terms of personnel and budget are available to administer snowmobiling on the refuge. The Dead Branch Division is approximately 1 hour from the Sunderland, Massachusetts headquarters, but Massachusetts Environmental Police Officers have the authority to enforce State snowmobile regulations on SAM trails and are the primary law enforcement agency for snowmobiling in Massachusetts. This would be a continuation of how snowmobile laws and regulations were administered when the land was owned and managed by the previous owners. This portion of the Conte Refuge is covered by a Zone Refuge Law Enforcement Officer. Refuge staff will be responsible for onsite evaluations to resolve public use issues, monitor and evaluate impacts, maintain boundaries and signs, and meet with state officials, adjacent landowners and the interested public, when necessary. All costs for trail maintenance and repair are borne by SAM and carried out by the local snowmobile club under a refuge SUP.

Annualized costs associated with the administration of snowmobiling on the Refuge are estimated below:

| **Initial Costs** | |
|---|---|
| *Document preparation/review/public comment* | $1,000 |
| *Supplies* (kiosk construction, brochures, kiosk notices) | $3,500 |
| *Traffic counter purchase* | $2,000 |
| *Law enforcement/responding to the public* | $1,000 |
| **Total Initial Costs** | **$7,500** |

| **Annual Costs** | |
|---|---|
| *Issue & administer SUP* (GS-12 Refuge Manager) | $1,000 |
| *Refuge law enforcement* (GS-11 Zone Officer) | $1,000 |
| *Resource impact evaluation* (GS-12 Refuge Manager) | $1,000 |
| *Visitor contacts* (in addition to Law Enforcement) (GS-12 Refuge Manager) | $1,000 |
| *Traffic counter maintenance/data collection/analysis* | $1,000 |
| *Miscellaneous* | $500 |
| **Total Annual Costs** | **$5,500** |

The estimated costs listed above are primarily salary costs. Monitoring public use and providing law enforcement are required for properly administering public use programs; therefore, these operations are accounted for in budget and staffing projections. Additional law enforcement on the division is provided by Massachusetts Environmental Police Officers at no cost.

No special facilities or resources are needed to administer snowmobile use on the Dead Branch Division. There is no cost to the Refuge for trail maintenance which is provided by the local snowmobile clubs with funds from SAM. This trail is lightly used during the rest of the year, so no additional maintenance considerations are necessary.

Based on a review of the budget allocated for recreational use management, we certify that annual funds are adequate to ensure compatibility and to administer and manage the recreational use described above.

## ANTICIPATED IMPACTS OF THE USE:

Potential direct negative impacts resulting from snowmobile use on 0.2-mile trail include habitat loss and damage, pollution, and disturbance to wildlife and other refuge visitors. A positive effect of allowing this type of access will be winter access for a segment of the public that may not otherwise spend time on the refuge. By constructing an informational kiosk at a key location, these visitors will be exposed to educational panels and materials that will inform them of the division's role in wildlife conservation in the Connecticut River Watershed, the Refuge System, and Service.

### Habitat Loss and Damage

This trail has been used for many year, although the exact date of trail opening is unknown. This generally north-south oriented trail directly affects approximately 0.3 acres of land or about 0.03 percent of the current division landbase. The direct loss of habitat is considered inconsequential because travel and trail grooming only commence when there is a sufficient snow pack. Trails are closed in the spring or during the season if patches of ground become exposed.

The most common impacts to vegetation attributable to snowmobiles are physical damage like bending and breaking when hit or run over (Stangl 1999). Additionally, plants are impacted during trail maintenance when shrubs and sapling trees are trimmed back; however, similar impacts occur throughout the power line corridor where vegetative growth is retarded to protect the electrical lines. Trimming associated with the snowmobile trail is done by hand or with power brush cutters which sets back growth, but does not kill the plants. Brush cutting only occurs when woody plants encroach within the trail corridor or are tall enough to protrude above the snow surface. Plants in the snowmobile trail probably end winter dormancy later and are less productive than those that are unaffected (Stangl 1999). No federally listed or State-listed plants are known from the area encompassing the snowmobile trail. The amount of habitat directly affected by the snowmobile trail represents a small percentage of similar habitat in the division.

### Soils

Soil temperature fluctuations are moderated during winter by a covering of snow. When this layer is compacted, as is the case with a snowmobile trail, soil temperatures are generally lower and freezing is deeper which can be detrimental to both plants and soil microbes (Douglass et al. 1999, Stangl 1999). Impacts depend on snow depth, traffic intensity, and soil and plant susceptibility. Bog soils and shrubs are particularly susceptible to these types of impacts (Stangl 1999). Compacted snow melts rapidly and has lower water holding capacities (Douglass et al. 1999), which can increase erosion during spring melt, particularly on slopes. Probable soil impacts on this include compaction and possibly localized erosion. However, there is no perceptible evidence of substantial soil or plant degradation and erosion is minimal on this generally flat trail.

### Air Resources

Until recently, two-stroke snowmobiles with traditional carburetors were the only models available. Within the last few years manufacturers, responding in part to calls for quieter and cleaner burning snowmobiles, have brought direct injection, two-stroke and four stroke engines to market. Two-stroke engines are commonly preferred for their better power to weight ratio (Braven 2009), although advancements in four-stroke technology has improved their performance.

Two-stroke carbureted snowmobile engines emit pollutants, particularly hydrocarbons and particulate matter, through exhaust systems from an incomplete combustion of fuel and oil (NPS 2000, GAO 2000). Four-stroke engines are cleaner, but still produce similar levels of carbon monoxide and oxides of nitrogen (University of Wyoming 2000). A recent addition to the market has been direct injection two-stroke snowmobiles that emit

fewer pollutants than the carbureted versions. In fact, these engines can cut hydrocarbon emissions by about 70 percent (NPS 2000).

According to information cited by the U.S. General Accounting Office (2000), the National Park Service concluded, primarily through analyses of studies in Yellowstone and Grand Teton national parks, snowmobiles caused increased levels of air pollution. At that time traditional two-stroke engines were the only versions readily available. On an average day in Yellowstone National Park during the 1990s over 700 snowmobiles entered the park (NPS 2000), with peak day with peak day use exceeding 2,000. The park averaged 66,619 snowmobile visits annual from 1992 to 1999. Up to one-third of the fuel can pass through the exhaust, unburned (University of Wyoming, Institute for Environment and Natural Resources 2000). Two-stroke snowmobiles reportedly produced 68 to 90 percent of the hydrocarbons and 35 to 69 percent of carbon monoxide emissions at those parks during the winter (NPS 2000). In response to concerns including air pollution, Yellowstone National Park is in the process of developing a long-term plan for winter operations, including snowmobiles (NPS 2013).

A study cited in the Final Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS) for the Little Pend Orielle National Wildlife Refuge (Little Pend Orielle Refuge) in northeastern Washington stated that average snowmobile emission per hour is 216 grams of hydrocarbons and nitrous oxide and 564 grams of carbon monoxide per horsepower (USFWS 2000). Reportedly, a 54-horsepower two-stroke, carbureted snowmobile engine was estimated to emit approximately 360 times as much pollution per hour as an automobile. It should be noted that this information is based on the higher polluting, traditional two-stroke engines.

Other studies cited in the CCP claimed that such air pollutants can result in foliar injury, reduced productivity, tree mortality, decreased growth, altered plant populations, modifications in species diversity, increased susceptibility to pests and diseases, and pollutant depositions that melt into streams during spring snow melt. Neither the exposure levels nor duration necessary to cause these effects were stated. These impacts were derived from a literature source and the CCP does not say whether these impacts were evident on the refuge.

The amount and impact, if any, of snowmobile emissions at the Dead Branch Division have not been studied. Neither have the effects of snowmobile exhaust emissions on habitat or wildlife, but the types of vegetative impacts described in the Little Pend Orielle Refuge CCP are not evident at this division. Annual snowmobile traffic at the division has not been monitored but it undoubtedly is substantially lower than those reported for Yellowstone, where, outside of the high concentration areas around West Yellowstone and Old Faithful, snowmobiles were not substantially affecting atmospheric deposition of the principal pollutants (Ingersoll 1998). This author reported diminished levels of carbon monoxide, a primary emission compound from two-stroke snowmobiles, at monitoring stations 20 and 100 meters from park entry points. The influence of snowmobiles on air quality is expected to diminish in the future because viable alternatives to higher polluting two-stroke snowmobiles are becoming more popular.

Pollutants are emitted by snowmobiles using the Dead Branch snowmobile trail. There is no evidence of chronic air pollution, similar to what was described for a high elevation site in Wyoming (Musselman and Korfmacher 2007). Undoubtedly, frequent winds dispersed pollutants more rapidly at their Wyoming study area, but dispersion also appears to be relatively quick at Dead Branch.

## Aquatic Resources

The impacts of snowmobile exhaust on aquatic systems have not been well studied, but fish can acquire and accumulate hydrocarbons (Ruzycki and Lutch 1999). Adams (1975) found hydrocarbon levels and lead to be at high levels the week after ice out in a Maine pond where snowmobiles were driven over ice during the previous winter. Lead no longer is an additive in gasoline, and therefore, not a concern. Repeated packing of snow during grooming can accumulate pollutants on developed trails which are then released during spring runoff (Ruzycki and Lutch 1999). The effects of snowmobile exhaust on aquatic invertebrates have received little attention. Currently, the trail crosses the Dead Branch on a snowmobile bridge as it enters the division. This stream supports a fishery cold water fishery.

Water pollution from snowmobiles is certainly a concern, but the traffic at Dead Branch is undoubtedly less than the study sites discussed in Olliff and Kaeding (1999). The industry movement toward less polluting

snowmobiles will reduce threats to aquatic systems. Strategic monitoring may be warranted to evaluate snowmobile impacts to the Dead Branch.

## Disturbance to Wildlife

Winter is a particularly stressful period for resident wildlife in northern latitudes due to severe weather, limited food resources, the energetic costs of moving through snow, and in some places, thermal cover limitations. Disturbance from any source during winter can tax energy reserves and be a contributing factor to winter mortality and affect reproduction. Several factors influence the impact of disturbance including timing, frequency, duration, and extent; physical condition of the individual animal; weather; habitat, particularly thermal cover, forage availability, quality, and spatial arrangement; and snow conditions. Late winter and early spring snow storms can be lethal, especially to pregnant females and those that are old, young, or in poor health.

Although individual animals certainly come into visual or auditory range of snowmobiles on the division and react by moving back into cover, there is no evidence to suggest that wildlife populations are being negatively affected. No specific evaluation of disturbance has been done at the Dead Branch Division, but a study of wildlife use in the vicinity of snowmobile trails at the Nulhegan Basin Division located in Essex County, Vermont, was recently completed (Benoit et. al. 2008). This work detected some differences in wildlife use near active snowmobile trails and unused trails, but the results were inconclusive because of confounding difference in snow accumulation between the two study years (2005 and 2008) and the habitat type adjacent to trails.

Some of the potentially negative effects of snowmobiling and other winter recreational activities on resident wildlife include:

1. Energetic costs of displacement by recreationists (Picton 1999). Herbivores, especially ungulates, operate at an energy deficit depending on stored body reserves during winter because high quality food is not readily available. Additional stress caused by recreationists flushing them from winter habitat can increase susceptibility to disease and predation, lead to higher mortality rates, and reduce productivity.

2. Displacement of animals into marginal or ineffective habitat (Clark and Wiseman 1999). High quality winter habitat is a key to survival for many herbivores, because of the close proximity of thermal protection and forage. Actions that cause animals to move to marginal habitats can lead to increased energy consumption during cold periods; increased travel distances for forage, decreased nutritional intake and reductions in thermal efficiency. Each of these can contribute to higher mortality rates.

3. Animals that are disturbed may alter their daily activity patterns leading to increased energy consumption and higher risk of predation (Clark and Wiseman 1999).

4. Direct mortality from collisions with snowmobiles.

Snowmobiling can have a limited, beneficial influence for some wildlife. Compacted snowmobile trails often serve as travel corridors because they are easier to walk on than adjacent deep snows. This was observed anecdotally in the study at the Nulhegan Basin Division (Benoit et. al. 2008). These trails may increase the probability of predator-prey confrontations. Snowmobile trails may allow some species to exploit new areas during winter. For instance, the compacted snow on trails appears to be necessary for coyotes to inhabit areas with deep snow (Bunnell et. al. 2006). This probably contributed to occupation of marginal habitats in the Northeast (Crete and Laiviere 2003) and a breakdown in spatial segregation of Canada lynx and coyotes during periods of deep snow (Bunnell et. al. 2006) where the two species overlap.

Most of the recent research of the effects of snowmobiling on wildlife and habitats has been conducted in the Greater Yellowstone Ecosystem (e.g., Olliff et al. 1999, Caslick 1997a, White et al. 2006). The conditions under which these studies were conducted including the number of snowmobiles per day (i.e. over 1,000 on a busy day) (Sacklin et al. 2000), affected habitats, and even species studied (e.g. bison and elk) may not have direct applicability to the Northeast and the Dead Branch Division. Older research was limited to studying two-stroke, traditional carburetion snowmobiles that used leaded fuel. These machines are much noisier than newer models and emit more pollutants, which at the time, included lead. Although that type of snowmobile is still the most common, newer direct-injection and four-stroke engines which are much less polluting are becoming

more popular. So the application of the body of work on snowmobiling effects may not always be relevant to the situation at this division.

Most wildlife-related research has been limited to studying the effects of snowmobiling on individuals, then extrapolating potential impacts to populations. There has been little work done on the influence of snowmobile use on population dynamics. Although no direct research has been done on winter recreational effects, including snowmobiles, at the Dead Branch Division, deer populations in Western Massachusetts are at goal levels (Christensen 2011). The section of trail on the Dead Branch Division is too short to have a substantial impact on deer populations, but because it is part of a trail network it is important to consider the larger landscape. The extensive network of snowmobile trails west of the Connecticut River does not appear to be negatively impacting population levels.

Most of the Federal trust species (e.g. Neotropical migratory birds, waterfowl, American woodcock) are on winter ranges well before the start of snowmobile season and do not return in the spring until after the trails close. The trail on Service-owned land does not intersect any habitats that would serve as winter concentration areas.

Snowmobile travel on and through the division is limited to the established snowmobile trail confining disturbances to a specific area. The timing, location, and occurrence of snowmobile use are fairly predictable which allows wildlife to habituate (Biel 1999, Freddy et al. 1986). At least one study found that heart rates increased whenever snowmobiles were present with no apparent habituation (Moen et al. 1982), although the implications to survival were not assessed. Trail maintenance with a groomer often occurs at night when conditions warrant. Assuming the use of the trail corridor for wildlife is compromised by snowmobile use, the total area impacted is approximately 2.4 acres assuming a 100-foot-wide area of impact, representing about 2 percent of the division.

Wildlife that hibernate or go into a dormant state during the winter such as black bears, reptiles, amphibians are not directly impacted by snowmobile travel because use is limited to the trail in the utility corridor which affords little, if any, good winter hibernaculum habitat. Some small mammals (e.g. voles) remain active below the snow surface (i.e. subnivean habitat). The compacted snowmobile trail may be a barrier to their movement and can alter subnivean conditions such as lowering temperatures (Caslick 1997b). However, only a small portion of habitat at the division (0.3 percent) might be marginalized for these species.

## Impacts to Visitors

Snowmobile engine noise increases with the amount of traffic and proximity of the listener. Yellowstone National Park officials believed that snowmobile use conflicted with the solitude of Park visitors, and the noise had an impact on the natural quiet of the park setting (GAO 2000). Snowmobile noise levels have not been documented at the Dead Branch Division; however, Massachusetts regulations prohibit use of snowmobiles producing sound pressure levels of more than 96 decibels when measured from a distance of 20 inches using the Society of Automotive Engineers Standard J1287 JUL98 (Commonwealth of Massachusetts Undated a). These levels approximately equate to that experienced along a busy street (American Speech Language and Hearing Association Undated). Although the sound is present to some degree on much of the refuge, attenuation reduces the levels so that if discernable, it becomes more of a background sound on the northern portions of the division. There are few, if any, areas of the division completely devoid of motorized sounds because it is surrounded by public roads.

Currently, pedestrian visitors have no developed access during winter. People hiking, snowshoeing, or skiing have the option of using the groomed snowmobile trail or making their own snow trails. Few people hike this area because until recently it was a private sawmill.

## Summary of Anticipated Impacts

In summary, many studies identify and discuss snowmobile impacts to wildlife, their habitats, and other outdoor recreational users. Clearly, snowmobiles can have an effect on wildlife when the two are in close proximity. The typical reaction of wildlife is to move into cover to avoid the disturbance. Snowmobile use on the Dead Branch Division will be restricted to the 0.2-mile section of existing trail. Based on available literature and monitoring at the nearby Nulhegan Basin Division impacts to wildlife are primarily to individual

animals that come in contact with the trail when snowmobiles are present. Reactions are subject to a variety of factors, but there is no evidence that snowmobile use on this trail will not have a deleterious impact on wildlife populations at the division, nor the federal trust species (i.e. migratory birds). At this time, based on professional judgment and the available information including the limited extent of the affected area, wildlife species present during the winter, and impacted habitats, regulated snowmobile use does not materially interfere with or detract from the purposes for which the Refuge was established or the mission of the Refuge System. Snowmobile use does provide the public with an opportunity to enjoy and experience the winter landscapes and engage in wildlife-oriented recreation, including priority public uses, in support of Refuge Purpose Number 6. It also gives the refuge a chance to inform a non-traditional visitor about the Dead Branch Division, Conte Refuge, Refuge System, and Service. From the perspective of a snowmobiler and SAM, the trail on Refuge property is an important connection to the trail networks that lie beyond the Refuge boundary.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement. It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The administration of snowmobile access and use on the refuge will comply with 50 CFR 27 and Massachusetts General Law 90B. The administration and management of the use as described in Section "(d)" above, and consideration, evaluation, and assessment of the impacts of the use as described in the "Anticipated Impacts of the Use" above, document our compliance with Executive Orders 11644 (Use of Off-Road Vehicles on the Public Lands, February 8, 1972) and 11989 (Off-Road Vehicles [ORV] on Public Lands, May 24, 1977) as summarized below.

*(1) Specific areas and trails shall be designated where snowmobile use is either permitted or prohibited.*

Public snowmobile travel on the division will be restricted to the historic, existing trail that crosses the division for approximately 0.2 miles. There also will be signs that identify the Refuge boundary on the trail and also require snowmobilers to stay on the groomed trail.

*(2) Designated areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands.*

Damage to soils and vegetation is minimal because the ground is frozen and a snow cover must be present for the use to occur; damage to water is minimized because snowmobiles travel on a hard-packed snow cover, not across water; and, damage to other resources is limited by restricting snowmobile use to the established trails.

*(3) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats.*

Wildlife harassment is minimized because: (a) trust species (i.e. migratory birds) are generally absent from the Dead Branch during the winter; (b) many resident species are dormant (e.g. black bears), under ice (e.g. beavers, muskrats, fish), or active under the snow (i.e. subnivean wildlife); (c) the trail does not intersect areas or habitats with significant concentrations of wildlife, including deer winter yards; and, (d) most active wildlife species during the winter are presumed to have acclimated to snowmobiles over the many years this trail has been in existence. The restricted area available and predictability of use, in time and space, make it reasonable to assume that resident wildlife populations can and have adapted to this long-term use.

*(4) Trails shall not adversely affect the natural, aesthetic, or scenic values of the lands.*

This trail will not measurably affect the natural, aesthetic, or scenic values because: (a) the amount of land directly impacted by the active trail is about 0.3 acres or about 0.3 percent of the 97.5-acre Division; (b) the trail lies adjacent to a former sawmill with considerable area cleared for buildings and log landings. The trail itself is confined to a patch of mixed hardwood forest that is common in this area; (c) the snow pack required for snowmobiling protects the ground surface, and the mechanical treatment of vegetation on the trail itself does not permanently damage plants; (d) litter associated with snowmobiling is removed by the snowmobile clubs during and at the end of the season.

*(5) Operating conditions shall be directed at protecting resource values, preserving public health, safety, and welfare, and minimizing use conflicts.*

Resource values are protected because snowmobile operating dates require sufficient snow pack to protect soils and vegetation from being damage. Use is discontinued if conditions become unsuitable. Public safety, health, and welfare are preserved and use conflicts minimized through the applicable provisions of 50 CFR 27.31, Massachusetts General Law 90B. Specifically, use is limited to the designated snowmobile trail, noise level limits must comply with State regulations, vehicles must meet the Federal and State standards for safe operation, reasonable and prudent operation is required, and unsafe trail conditions trigger closure. Pedestrian visitors are not precluded from using the snowmobile trail or if they prefer, may snowshoe or ski anywhere else on the division.

*(6) Areas and trails where ORV use is permitted are well-marked and information about location and conditions for use are made available to the public.*

Recreational snowmobile use at the Dead Branch Division is limited to the 0.2-mile section of trail near the western boundary. Standard State or refuge snowmobile trail signs will be posted at key points. The refuge boundary will be posted on both trail entry sites. Updated trail conditions are available from SAM either by phone or on their web site *(http://sledmass.com/;* accessed April 2015). Visitors also can contact the refuge to find out about current conditions. SUPs issued to local snowmobile club will contain specific special conditions that govern their operation and use of the trail.

*(7) Provisions are made for law enforcement.*

The Dead Branch Division is unstaffed, but a Zone Law Enforcement Officer is available. Officers from the Massachusetts Environmental Police have conducted law enforcement on this trail in the past as part of their normal duties, and will continue to do so on the division.

*(8) Effects of ORV use must be monitored.*

Snowmobile use on the refuge will be monitored and effects evaluated. Monitoring will be done via observations of trail use by refuge staff and the partner snowmobile club. Federal and State law enforcement patrols will help ensure that people comply with regulations to minimize biological and recreational conflicts. Condition of the trail itself will be evaluated at the end of each season and periodically during the season to ensure that unacceptable resource damage is not occurring.

*(9) If it is determined that ORV use is causing considerable adverse effects on soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails, those areas must be closed until adverse effects are eliminated or preventive measures have been implemented to prevent recurrence.*

As stated in Number 8 above, monitoring use of the trail will be an ongoing process. Because there is only one trail on the Dead Branch Division the primary resource concerns are impacts to soil, surface water, and resident winter wildlife. Refuge staff will monitor trail conditions to ensure that there is sufficient snow pack to support snowmobile use. The trail does not traverse any habitats key to wintering wildlife such as deer thermal cover; however, the trail will have limited effect on species that spend the winter under the snow surface in the utility corridor.

Should unacceptable resource impacts occur, appropriate action will be taken to alleviate problems. Actions may include more restrictive limitations on engine exhaust emissions or noise levels, limiting the number of snowmobiles on the division, and trail relocation or closure. These or other actions may be necessary in the future to ensure that snowmobile use does not materially interfere with or detract from refuge purposes or the mission of the Refuge System, as previously described. Compatibility could be reconsidered before the term of this compatibility determination should the conditions change significantly, or there is new information regarding the effects of snowmobiling that warrants an updated evaluation.

*(10) Snowmobile use is only permitted during refuge open hours. A special use permit is required for use outside of one-half hour before sunrise and one-half hour after sunset.*

*(11) We will allow snowmobiling following MassWildlife snowmobiling guidelines, where otherwise compatible and consistent with applicable Service laws, policy, and guidelines. We would also continue to meet each year with the snowmobile clubs permitted for each respective trail to review special use permit stipulations and conditions.*

## JUSTIFICATION:

This use has been determined to be compatible provided the stipulations necessary to ensure compatibility are implemented, and the use does not exceed thresholds necessary for visitor safety and resource protection. This use is not expected to materially interfere with or detract from the mission of the Refuge System nor diminish the purposes for which the refuge was established, will not pose significant adverse effects on refuge resources, will not interfere with public use of the refuge, nor cause an undue administrative burden.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Snowmobiling on Designated Snowmobile Trails on the Nulhegan Basin Division

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✔ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No ____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Snowmobiling on Designated Snowmobile Trails on the Nulhegan Basin Division

## NARRATIVE:

Vermont contains an extensive Statewide snowmobile trail system (SSTS) which is administered by the Vermont Association of Snow Travelers. Several miles of this trail network occur on the Nulhegan Basin Division and the McConnell Pond tract, which is proposed for acquisition under the preferred alternative of the Silvio O. Conte National Fish and Wildlife Refuge's (Conte Refuge) Comprehensive Conservation Plan (CCP). Snowmobile recreation is a critical part of the local economy during winter months in this portion of northeastern Vermont. The refuge is often covered with snow from November to April. The snowmobile trail provides a means of controlled access to the refuge in the winter months, and can provide an opportunity for visitors to engage in wildlife-dependent recreation, such as wildlife observation and hunting. This use may contribute to public understanding of, and appreciation for, the refuge's natural resources by providing opportunities for participants to experience the refuge, see refuge habitats, and support wildlife-dependent recreation during winter when access to the majority of the refuge is otherwise limited.

The existing snowmobile trail network was established well before the division was created in 1999. The overwhelming majority of the network lies along gravel roads that are open to passenger vehicle travel during the non-winter months, while the remaining length follows "grass" roads, which were originally used by commercial trucks to haul logs during winter. Due to the season of use, potential impacts are minimized because the ground is frozen and fewer species and fewer numbers of wildlife are present. This is an historic use of the division, and is consistent with the environmental assessment prepared for the division's establishment (USFWS 1999). This use has been allowed on the refuge since the refuge was established with no significant adverse effects observed in terms of public safety (one reportable accident in tens of thousands of visits). We do not anticipate any major conflicts between snowmobilers and other users, because although pedestrians (cross-country skiers/snowshoers) will be allowed on the snowmobile trail network, such use is expected to be light as there are additional pedestrian-specific trails available during the winter.

For these reasons, we have determined that continuing to allow this use is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

## REFERENCE:

U.S. Fish and Wildlife Service (USFWS). 1999. Final Environmental Assessment: U.S. Fish and Wildlife Service Participation in a Partnership to Protect "the Champion Lands" in Essex County, Vermont–Options for Protecting the Nulhegan Basin Special Focus Area. 78pp.

# COMPATIBILITY DETERMINATION

## USE:

Snowmobiling on Designated Snowmobile Trails on the Nulhegan Basin Division

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority public use?**
The use is public snowmobile access on and through the Nulhegan Basin Division (division) of the Silvio O. Conte National Fish and Wildlife Refuge (refuge), on existing Vermont Statewide Snowmobile Trail System (SSTS) trails. It is not a priority public use of the National Wildlife Refuge System (Refuge System), under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the

National Wildlife Refuge System Improvement Act of 1997. This compatibility determination pertains only to non-commercial snowmobile access and use on the division by the public; commercial snowmobile tours are a different use and would need to be considered separately.

**(b) Where would the use be conducted?**
Snowmobile use is currently permitted on the division as part of the Vermont SSTS. This use predated U.S. Fish and Wildlife Service (Service) acquisition of the division in 1999 and was approved in the environmental assessment (USFWS 1999) establishing the division and in a corresponding compatibility determination. The 33-mile trail network on existing refuge lands has remained constant in location and extent since the land was acquired. The SSTS on the division provides multiple connective links that enable snowmobile access to surrounding public and private lands.

Under our Service-preferred alternative C, the division will be expanded via acquisition of the McConnell Pond tract, among other parcels. Under this scenario, we propose a network of trails totaling approximately 40 miles (map D.5). The overwhelming majority (more than 98 percent) of the snowmobile trails are located on existing gravel roads. In addition, a new trail segment of approximately 1.4 miles is proposed to link the division's visitor contact station with the main trail network. This will occur primarily on private land, with less than 600 feet of new trail on refuge land. The refuge segment will be on an upland site immediately south of Vermont Route 105. An approximately 2-mile reduction among the existing trail network is proposed to offset this addition. This would include a narrow wooded trail segment occurring on native ground and reduction of one-half of a small loop trail.

**(c) When would the use be conducted?**
Use of the SSTS on the division is permitted from December 15 to April 15, dependent upon acceptable levels of snow cover. Snowmobile access and trail grooming are permitted during daytime and nighttime hours. When snowmelt exposes road surfaces, entrance gates on division roads are closed and locked for the duration of the spring mud season and further snowmobile access is prohibited. This is similar to what occurs on neighboring lands that allow snowmobiles. General trail maintenance activities such as brush cutting and the removal of downed trees also may be performed occasionally during the late summer and fall.

**(d) How would the use be conducted?**
The SSTS and its use are administered by the Vermont Association of Snow Travelers, Inc. (VAST). State law requires compliance with Title 23 ("Snowmobile Laws") of the Vermont Statutes, which includes provisions for annual registration and insurance, and requirements for lawful operation and use of snowmobiles on private and public lands. Throughout the SSTS, local snowmobile clubs are responsible for maintaining trails within the clubs' designated areas of operation. Purchase of an annual local club membership and Trails Maintenance Assessment permit (TMA) are required by the State for use of the SSTS. Club membership receipts fund equipment and trail maintenance in the club's area of operation, and revenues from TMA purchases allow VAST to administer the SSTS, and are disbursed to local club trail maintenance projects and equipment needs. Lastly, revenue generated from snowmobile registrations is distributed to VAST and public safety agencies (Vermont State Police, Vermont Fish and Wildlife Department (VFWD), County Sheriff's Departments) for law enforcement efforts within the SSTS. Purchase of a TMA grants the holder permission to use the SSTS (including the portion located on the division) by virtue of the local clubs having secured prior permission from landowners for trail placement on their lands.

Snowmobile access and use will be conducted according to applicable provisions of 50 CFR 27.31 ("General Provisions Regarding Vehicles"), Title 23 of the Vermont Statutes, and Executive Orders 11644 *(Use of Off-Road Vehicles on the Public Lands,* February 8, 1972) and 11989 *(Off-Road Vehicles on Public Lands,* May 24, 1977) - (see discussion of compliance with Executive Orders under the "Stipulations to Ensure Compatibility" section, below). Use and maintenance of the SSTS on the refuge is administered through an annual Special Use Permit (SUP) collectively issued to VAST and three local snowmobile clubs: Brighton Snowmobile Club, Northeast Kingdom Snowblasters, and Canaan Border Riders, Inc. The Service requires VAST to carry $2 million of general liability insurance with the United States of America named as an "Additional Insured." Local clubs and VAST are collectively responsible for accomplishing trail maintenance and infrastructure repair. The refuge requires local clubs to place trail junction, trail number, safety, and speed limit signs–at locations designated by the refuge manager–prior to December 15, and maintain them through the period of snowmobile use. Signs are collected prior to refuge roads opening in the spring. Local clubs smooth trail

surfaces with tracked groomers equipped with 12-foot, straight, front plow blades and drags 9 feet in width and 12 feet in length. The approximate weight of a groomer with this equipment is 6 tons. Trails are typically groomed to a width of 10 to 16 feet depending on the underlying road width and snow conditions. Grooming typically occurs on the division 4 to 6 days per week depending on the weather, snowfall, and trail conditions; a given trail is generally groomed once each week. Grooming generally occurs at night. In late summer or fall, clubs maintain trails, as necessary, by cutting back woody brush that restricts trail width, and by removing trees that may have fallen across trails. Under the SUP, use of all-terrain vehicles (ATVs) by club members is authorized for trail maintenance and to install signs only when and where travel by pickup truck is not feasible (e.g., during mud season). The SUP does not provide for new trail construction (the trail proposed to access the visitor contact station is evaluated in the companion Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS).

The refuge manager and representatives from Vermont Agency of Natural Resources, Plum Creek Timber Company, VAST, and local snowmobile clubs meet annually to discuss use of the SSTS-designated trail network on their lands. Locations of approved trails are depicted on Essex County and Vermont snowmobile trail maps. Designated SSTS routes on the refuge have remained constant since the lands were acquired. Modifications of SSTS routes on the refuge must be coordinated prior to the upcoming season between the refuge manager and officials from VAST and local clubs, or as public safety, environmental, or management circumstances dictate during the snowmobiling season.

The maximum speed limit for snowmobiles on the refuge is 35 miles per hour. This is consistent with speed limits on adjacent ownerships and on State-owned lands elsewhere in Vermont. A "reasonable and prudent" snowmobile operation (Vermont) statute is in effect—such operation also is addressed in 50 CFR 27.31. Off-trail travel is not permitted. There are no time-of-day restrictions; however, use occurs primarily during daylight hours, and the majority of travel occurs between approximately 12 p.m. and 6 p.m. according to analysis of traffic counter data and refuge staff observations. Snowmobilers typically travel in groups of two or more snowmobiles.

Snowmobiles may also be used to access the approximately 30 privately owned recreational cabins that exist within current and proposed refuge lands. Most owners do not visit their cabin during the winter, although a handful of cabin owners regularly do so. While a majority of these cabins are located adjacent to the SSTS, several are not. A refuge SUP is required to access cabins not immediately on the SSTS. The SUP requires access via the most direct route, approved in advance, from the nearest SSTS or public highway. It is expected that fewer than five SUPs will be issued each year.

**(e) Why is this use being proposed?**
All of the existing designated snowmobile trails were established decades prior to Service acquisition. The previous landowners allowed public snowmobile use of these trails and snowmobile recreation is a critical part of the local economy during winter months. The division receives an average of 85 to more than 100 inches of snow annually, and the ground can be covered with snow from November to April. Snowmobile trails provide a means of controlled access to the refuge during winter months, and can provide an opportunity for visitors to engage in wildlife-dependent recreation, such as wildlife observation and hunting. The existing trails also provide winter access to a broader landscape of conserved lands including holdings by Plum Creek Timber Company, and the State of Vermont.

At the time the division was acquired, local citizens, adjoining land owners, and State government officials were concerned about the Service's intentions regarding the future of snowmobile access–and many continue to harbor concerns. As a condition of support for Service acquisition of lands in the Nulhegan Basin, citizens and partners wanted assurances of which uses would be allowed, due in part to the great economic importance of snowmobiling to the Northeast Kingdom, and the associated role of the SSTS on these former industrial timber lands.

The Service signaled its intention to continue snowmobile access, if compatible, in the document "A Conservation Partnership for the Nulhegan Basin and Paul Stream Area - Public Ownership by the Vermont Agency of Natural Resources and the United States Fish and Wildlife Service - January 28, 1999" (see Appendix 3 of the Nulhegan Basin Division Environmental Assessment, USFWS 1999). Language in the document also explicitly stated the Service's commitment "...to provide access to wildlife-dependent and other

compatible recreation purposes." The Service's position in this conservation partnership was explicitly based on the fact that snowmobile access and use on the division must be determined to be a compatible use (603 FW 3), and if indeed determined as compatible, the use must be managed to ensure continued compatibility.

Snowmobiling is a popular winter activity in Vermont and retaining access to the division would allow introduction of the division, the Refuge System, and the Service to people that may not traditionally recreate on refuges. Snowmobile access provides the visiting public with an efficient means of winter transport onto and through the division, the opportunity to engage in wildlife-dependent recreation activities, and extends the Service's reach to those people who come from throughout the New England to snowmobile in northeastern Vermont. Refuge staff have observed visitors on snowmobiles that were engaged in wildlife observation (sight and sign), photography (wildlife and scenery), snowshoe hare hunting, trapping, interpretation (habitat management signage, experiencing viewsheds of conserved habitats and basin topography from scenic vistas). In addition, visitors were observed to have traveled to certain locations on the refuge via snowmobile and then continued their travel on snowshoes or cross-country skis. We also provide kiosks with refuge information and interpretive materials at the three main entrances used by snowmobilers to help orient visitors to the Refuge System and refuge and provide information on refuge wildlife and habitats. Also, under the Service-preferred alternative in the draft CCP/EIS, we propose creating a connector snowmobile trail to the division's headquarters office and visitor contact facility, which includes interpretive materials and other information about refuge resources.

## AVAILABILITY OF RESOURCES:

The resources necessary to provide and administer this use are available within current and anticipated refuge budgets. Staff time associated with administration of this use includes: issuing annual permits to VAST and local snowmobile clubs, general oversight of trail maintenance activities, monitoring compliance with permit conditions, enforcement of trail regulations, monitoring use patterns, monitoring potential impacts of the use on refuge resources and visitors, and providing information to the public about the use. Currently the program is administered by the wildlife refuge manager, with assistance from the wildlife biologist and federal wildlife officer.

Annualized costs associated with the administration of snowmobile access on the refuge are estimated below:

| | |
|---|---|
| *Issue and administer SUPs/Coordinate with VAST and local clubs* (Wildlife Refuge Manager) | $880 |
| *Law enforcement - patrol/visitor-resource protection/public use monitoring/enforcement/outreach* (Federal Wildlife Officer) | $10,800 |
| *Resource impacts/monitoring/evaluation* (Wildlife Biologist) | $2,500 |
| *Snowmobile gas/maintenance* | $2,500 |
| **Total** | **$16,680** |

The estimated costs listed above are predominantly salary costs. Monitoring visitation and the impacts of public uses on resources, and providing law enforcement are required for properly administering public use programs; therefore, these operations are accounted for in budget and staffing. In addition to Service officers, law enforcement coverage on the division during critical periods is often provided, at no cost to the Service, by officers from our partner agencies: VFWD, Vermont State Police, and Essex County Sheriff's Department.

No special facilities or resources are needed to administer this use. Maintenance of the SSTS on the division is conducted as needed by the snowmobile clubs; the refuge incurs no expense from these activities. Any road maintenance activities financed by the refuge during the summer or fall are performed to properly maintain roads for automobile travel, and with the exception of bridge or large culvert work, have, at most, an indirect benefit for snowmobile travel. Therefore, costs for road maintenance are not relevant for analyzing costs incurred due to snowmobile use of the division.

## ANTICIPATED IMPACTS OF THE USE:

Continuing to allow snowmobile access to the division will allow the public to visit areas that are otherwise difficult to access during the winter months. Potential negative impacts of snowmobile use include habitat damage, pollution, and disturbance to wildlife. Informational kiosks and interpretive panels will inform visitors of the division and refuge's role in wildlife conservation within the Connecticut River watershed and northern New England.

Monitoring efforts have included a multi-year visitor use study, a wildlife impact study, an investigation of potential snowmobile-generated pollution, annual traffic monitoring, and incidental monitoring by staff. Visitor use of the division has been measured by Dr. John Davis of University at Albany, State University of New York (SUNY); potential impacts on wildlife from snowmobiling were studied by the Northwoods Stewardship Center; the division was included in a Statewide pollution study by VAST, and refuge staff has monitored snowmobile use annually since 2001. Traffic counter data and modeling estimate upwards of 14,000 snowmobile visits per season (J. Davis, unpublished report). This level of use has been relatively consistent over the years. However, snow conditions at the division compared to conditions in southern New England, season length, and perhaps fuel costs can all influence the amount of snowmobiling activity. Weekends account for roughly half the use, with 37 percent of visits occurring on Saturdays alone.

The SUNY study distributed visitor survey cards during this multi-year visitor use study. Survey response was low; however, data for 2001 and 2002 described the activities of 109 respondents. In addition to snowmobiling, 42 of 109 respondents (approximately 37 percent) listed wildlife observation and photography as reasons for their visit.

The potential impacts are discussed in more detail below.

***Soil impacts:*** The snowmobiling season begins no earlier than December 16–and officially commences only when sufficient snow cover is present to allow for the grooming of trails and safe operation of snowmobiles. During the time that snowmobiles and trail groomers operate, the trails are covered with several inches to a foot or more of snow. Consequently, snowmobiles and groomers are not anticipated to have negative impacts on soils or to result in soil erosion. Trail maintenance occurs during the summer and fall. This is an occasional (i.e., less than annual) occurrence and includes mowing, culvert replacement, and bridge re-decking. Because more than 98 percent of the trail network overlays gravel roads, the majority of these maintenance activities likewise occur on or along roads. Consequently, any impacts to soils would be minimal and likely only involve previously disturbed soils, such as replacing a culvert within an existing road prism.

***Water quality impacts:*** The impacts of snowmobile exhaust on aquatic systems have not been well studied, but fish can acquire and accumulate hydrocarbons (Olliff and Kaeding 1999). Adams (1975) found hydrocarbon levels and lead to be at high levels the week after ice out in a Maine pond where snowmobiles were driven over ice during the previous winter. Lead no longer is an additive in gasoline, and therefore, not a concern. Repeated packing of snow during grooming can accumulate pollutants on developed trails which are then released during spring runoff (Olliff and Kaeding 1999). The effects of snowmobile exhaust on aquatic invertebrates have received little attention.

The concentration of hydrocarbons in snow is likely to be particularly high on trails were regular grooming constantly packs exposed snow (Oliff et al. 1999). Spring snowmelt may release those hydrocarbons into streams and other bodies of water (Oliff et al. 1999). A Statewide 2010 study commissioned by VAST (VHB Pioneer 2010) evaluated snowpack chemistry to detail the presence or absence of impacts from snowmobile traffic on the chemical composition of snowpack, soil, and runoff in the proximity of heavily traveled snowmobile trails. Two of the sample sites were on refuge trails. Snowmelt and runoff chemistry monitoring indicated no detectable levels of volatile organic compounds or total petroleum hydrocarbons in surface waters located immediately down-gradient of the snowmobile trails. Furthermore, snowpack chemistry monitoring indicated no detectable levels of volatile organic compounds or total petroleum hydrocarbons in background or on-trail snow sampling stations. Results showed no change in water chemistry for any of the sites sampled, including those on the refuge. Although this was a wide-ranging study, it only covered a single season. Therefore, additional replication would be useful to further assess the risk of hydrocarbon to refuge waters. However, based on the available data with a representative sampling of snowmobile use on the refuge,

improvements in snowmobile technology to favor 4-stroke engines, and the substantial water volumes involved, the pollutant impacts to waters are expected to be minimal.

***Air quality impacts:*** Within the last 10 years manufacturers, responding in part to calls for quieter and cleaner burning snowmobiles, have brought direct injection, two-stroke and four-stroke engines to market. Two-stroke engines are commonly preferred for their better power to weight ratio (*http://www.webs1.uidaho.edu/niatt/research/Project_Descriptions/KLK751.htm*: accessed May 2013), although advancements in four-stroke technology has improved their performance.

Two-stroke carbureted snowmobile engines emit pollutants, particularly hydrocarbons and particulate matter, through exhaust systems from an incomplete combustion of fuel and oil (USDI, NPS 2000, GAO 2000). Four-stroke engines are cleaner, but still produce similar levels of carbon monoxide and oxides of nitrogen (University of Wyoming 2000). In 2002, the market introduced direct injection two-stroke snowmobiles that emit fewer pollutants than the carbureted versions. In fact, these engines can cut hydrocarbon emissions by about 70 percent (USDI, NPS 2000). According to information cited by the U.S. General Accounting Office (2000), the National Park Service concluded, primarily through analyses of studies in Yellowstone and Grand Teton National Parks that snowmobiles caused increased levels of air pollution. At that time, traditional two-stroke engines were the only versions readily available. On an average day in Yellowstone National Park during the 1990s over 700 snowmobiles entered the park (USDI, NPS 2000) with peak day use exceeding 2,000. The park averaged 66,619 snowmobile visits annually from 1992 to 1999. Up to one-third of the fuel can pass through the snowmobile's exhaust, unburned (University of Wyoming 2000). Two-stroke snowmobiles reportedly produced 68 to 90 percent of the hydrocarbons and 35 to 69 percent of carbon monoxide emissions at those parks during the winter (USDI, NPS 2000). In response to concerns including air pollution, Yellowstone National Park is phasing in limits on the number and type of snowmobiles that will be allowed to enter the park in the future (*http://www.nps.gov/yell/planyourvisit/winteruse.htm*; accessed May 2013)

A study cited in the Final CCP for the Little Pend Orielle National Wildlife Refuge (USFWS 2000) in northeastern Washington stated that average snowmobile emission per hour is 216 grams of hydrocarbons and nitrous oxide and 564 grams of carbon monoxide per horsepower. Reportedly, a 54-horsepower two-stroke, carbureted snowmobile engine was estimated to emit approximately 360 times as much pollution per hour as an automobile. It should be noted that this information is based on the higher polluting, traditional two-stroke engines. Other studies cited in the Little Pend Orielle CCP claimed that such air pollutants can result in foliar injury (damage to plant leaves), reduced productivity, tree mortality, decreased growth, altered plant populations, modifications in species diversity, increased susceptibility to pests and diseases, and pollutant depositions that melt into streams during spring snow melt. Neither the exposure levels nor duration necessary to cause these effects were stated. These impacts were derived from a literature source and the CCP does not say whether these impacts were evident on the refuge.

With the exception of the water quality study mentioned previously, there has been no additional evaluation of snowmobile emissions at the division, such as those involving air quality. This would include the effects of snowmobile exhaust emissions on habitat or wildlife, but the types of vegetative impacts described in the Little Pend Orielle Refuge CCP are not apparent at the division. Studies at Yellowstone National Park found that outside of the high concentration areas around West Yellowstone and Old Faithful, snowmobiles were not substantially affecting atmospheric deposition of the principal pollutants (Ingersoll 1998). This author reported diminished levels of carbon monoxide, a primary emission compound from two-stroke snowmobiles, at monitoring stations 20 and 100 meters from park entry points. Adverse effects to air quality are not anticipated from this use for several reasons: impacts to vegetation as noted elsewhere have not been observed, the amount of snowmobile use is much less than that reported from some of the other locales, and the fraction of four-stroke snowmobiles is expected to increase into the future.

***Habitat impacts:*** Maintaining snowmobile access on 39.2 miles of existing gravel roads and 0.8 miles of "grass" roads (grass roads are typically densely covered with low grasses and forbs; they were used under previous ownership to haul logs during winter) within the division (and adjacent McConnell Pond tract if purchased by the refuge in the future) will not impact wildlife habitat directly as gravel roads generally do not represent quality wildlife habitat. The grass roads may be used by subnivean species on occasion; however, they constitute an extremely small portion of the trail network when compared to the larger division land base. Potential surface damage to roads is considered inconsequential because snowmobile travel occurs on snowpack ranging from several inches to several feet in depth. All stream crossings occur on bridges placed for the purposes of

vehicular travel. When snowmelt exposes road surfaces, trails are closed and refuge roads are gated and locked for the duration of mud season. Trail grooming occurs on a snow-covered surface; under normal circumstances, groomers are not making direct contact with the ground.

Annual road maintenance in support of passenger vehicle travel on the division–cleaning ditches, mowing roadside vegetation, and improving drainage–represents the extent of trail maintenance associated with snowmobile travel. These activities are conducted in late summer and early fall to avoid impacts to nesting birds. No federally listed plant species are known to occur on the division. State-listed (e.g., auricled twayblade) or rare plants are not impacted by the use (actual snowmobile travel or road maintenance) because these plants do not occur on roads or roadsides. Snowmobile use is limited to existing gravel and grass surfaced roads. Based on law enforcement patrols, little unauthorized off-trail use occurs, with most unauthorized use occurring on roads that may be open to the public during summer, but are closed to snowmobiles during winter. The continued use of snowmobiles is not expected to have noticeable adverse impacts to refuge habitats outside of the footprint of the existing road network.

***Wildlife impacts:*** As proposed, the area on the division encompassed by the SSTS totals approximately 67 acres, or about 0.2 percent of the total area. Snowmobile trails traverse the spruce-fir, northern hardwood, and mixed conifer/hardwood habitats that are typical on the division. Wildlife species occurring in these habitats include: various migratory birds (many of which will have migrated to southern wintering areas), resident birds (including spruce and ruffed grouse, jays, ravens, woodpeckers), snowshoe hare, moose, white-tailed deer, small mammal species, and various furbearers. Black bears, reptiles and amiles per houribians, beavers, and several fish species, including brook trout also occur in habitats traversed by SSTS trails, but these species normally are hibernating or under ice when snowmobiling occurs. For those resident and over-wintering bird species, we do not anticipate habitat impacts related to snowmobiling, nor do we expect a significant change in the use of habitats related to snowmobiling because this is a pre-existing use, limited to a well-defined trail network (off-trail riding is not allowed) and a local study was inconclusive (Benoit et al. 2008).

Winter is a particularly stressful time for many species of resident wildlife, because of the reduced availability and quality of food, and the higher energetic costs of snow travel and thermoregulation. Late winter is a particularly vulnerable time for many species (especially ungulates), because snow depths are often greatest, the animals are in their poorest condition, and food resources have been exhausted. A portion of the largest historic deer wintering area in the State occurs in the southwestern area of the division and extends into the McConnell Pond tract. Snowmobile trails are adjacent to or within the vicinity of this wintering habitat, and may impact wintering deer, although the literature is mixed as described below.

Snowmobiles are capable of covering great distances and thus have the potential for disturbing wildlife and compacting snow over a large area if they are not confined to designated trails (Hammitt and Cole 1998). Some potential negative impacts of snowmobiling (and other forms of human disturbance) on wildlife include:

- *Increased energy expenditure:* Disturbance may result in increased heart rate, activity, or actual flight, all of which have an energetic cost. During severe winters or for animals in poor or marginal condition, the additional stress of disturbance may result in exhaustion of an individual's food reserves and lowered resistance to disease or predation, therefore adversely affecting survival or reproduction. Herbivores, especially ungulates, operate at an energy deficit, depending on stored body reserves during winter because high quality food is not readily available (Picton 1999). Additional stress caused by recreationists flushing them from winter habitat can increase susceptibility to disease and predation, lead to higher mortality rates, and reduce productivity.

- *Displacement to suboptimal habitat:* Animals may be forced into habitats where foraging or cover is of lower quality. This may increase energetic costs, increase vulnerability to predation, or increase crowding and disease transmission. It may also alter the distribution of animals on the landscape.

- *Alteration of behavior:* Disturbed animals may change their foraging times to periods when energy losses or exposure to predators is higher.

- *Improved predator access:* The packed snow associated with a groomed snowmobile trail network can allow easier access for predators, such as coyote and bobcat (Buskirk et al. 1999). Such enhanced access could have consequences for wintering deer. Additionally, this can decrease the competitive advantages of predator species adapted to deep snow, such as lynx (Buskirk et al. 1999).

- *Direct mortality from snowmobile-wildlife collisions:* Reports of collisions on the refuge are infrequent. A moose was struck and later euthanized during the 2011-12 season (J. Dukette, VFWD, pers. comm.), although this is the only recognized instance of a collision in the past six years.

Some potential positive impacts of snowmobiling and other forms of human disturbance on wildlife follow:

- *Reduced energy expenditure:* Snow compaction related to the establishment of snowmobile trails may reduce energy expenditure in deep snow for animals that follow snowmobile trails.

- *Improved access to resources:* Snow compaction related to the establishment of snowmobile trails may expand access to foraging areas for animals using trails.

Although a moderately extensive body of literature evaluates the impacts of snowmobile activity on wildlife, particularly ungulates, the site-specific nature of much of the research and the complex interactions among the factors affecting wildlife make interpreting results and extrapolating them for the division difficult. The differences in methodology among studies make comparisons difficult and have compounded the problem. As a result, different studies have found apparently contradictory results that seem to be applicable only locally. This includes a 2-year study conducted on the division by Benoit et al. (2008) involving a comparison of animal track activity adjacent to trails open to snowmobiling and trails closed to snowmobiling. The data were conflicting, with the overall abundance of tracks and richness of species variable between trail types, hence the results proved inconclusive.

A few of the variables that may affect the type and degree of wildlife response to snowmobiles include the:

- Severity of winter snow conditions.
- Type of vegetation or habitat.
- Topography.
- Time of day and month of year.
- Level of habituation to disturbance.
- Animal age and condition.
- Species.
- Animal density and group size.
- Animal activity type (standing versus bedded down).
- Intensity of hunting.
- Intensity of snowmobile activity.
- Duration of disturbance.
- Behavior of snowmobile users.

Mammals may show less of an overt response to human disturbance when winter conditions are particularly severe and energy conservation is at its most critical (Knight and Cole 1995). Impacts may be at the individual or population scale and may be either short- or long-term.

Despite the apparent contradictions in the literature, many studies seem to indicate that snowmobiling may affect wildlife under certain conditions. Although population level impacts may exist, only impacts at the individual and local level have been demonstrated. Restricting travel to designated trails and avoiding important habitat areas can mitigate many of the negative effects.

## Canada lynx

The division has recently been documented as supporting reproduction of Canada lynx, a federally threatened species. Landscapes that support persistent populations of breeding Canada lynx are located within boreal forests that contain a mosaic of differing successional forest stages, along with the following characteristics:

- Abundant snowshoe hares and their preferred habitat, which include dense understories of young trees. Snowshoe hares are the primary food source for Canada lynx and hare density is considered the most important factor in explaining lynx distribution. It is generally believed that at least 0.2 hares per acre are required to support breeding populations of Canada lynx (Ruggiero et al. 2000);

- Winter snow conditions that are deep and fluffy for extended periods of time, because these conditions are thought to favor Canada lynx over their principal competitor, the bobcat;
- Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and
- Matrix habitat that facilitates Canada lynx travel between areas of high snowshoe hare abundance within established home ranges.

We are not aware of studies addressing direct impacts of snowmobile use on Canada lynx; however, studies of other predators and their use of snowmobile trails demonstrate potentially increased competition for prey. Studies of other predators show an increase in use of trails and competition for prey in lynx winter habitat in Canada, Alaska, and western U.S., although there is no evidence that this competition from coyote or bobcat negatively affects lynx populations in the core of their range. The Service stated in its decision to list the Canada lynx as a threatened species under the ESA (Federal Register Vol. 65(58): 16051-16086), that "packed snow trails facilitate the movement of coyotes into formerly inaccessible deep snow habitats occupied by lynx; however, we have no evidence that competition with coyotes, mountain lions or bobcats is negatively affecting lynx at a population-level scale." The Service based this statement on numerous studies conducted in the western U.S., Alaska, and Canada, which indicate that packed snow associated with ski, snowmobile trails, and roads makes travel easier for potential lynx competitors, such as coyote, into the deep snow habitats of the lynx. Somewhat contrary, Kolbe et al. (2007) noted that while coyotes remained in lynx habitat throughout the winter, their use of compacted snowmobile trails was less than expected.

Northeastern Vermont is at the southern edge of this species range, and the importance of Vermont for Canada lynx has not been evaluated by the Service. The relatively greater amount of habitat and human disturbances within the landscape surrounding the division and adjacent McConnell Pond tract, including the increased availability of packed snow trails, is different than that in the remote areas of Canada. Interagency monitoring and research on competition for prey, and snowmobile-related disturbance impacts on lynx will be necessary to identify the need for conservation measures to ensure their persistence in Vermont. Such measures may result in trail closures to eliminate packed snow conditions that provide access to other predators into winter lynx habitat.

## Ungulates (white-tailed deer; moose)

White-tailed deer expend more energy in winter than at other times of the year. To compensate, deer usually conserve energy by restricting their movements, particularly in late winter, when they lack fat reserves and snow is deeper, rather than increasing their food intake by foraging more widely (Moen 1976). Energy conservation measures include walking slowly, on level ground. Thus, they are particularly vulnerable to disturbances that counter that energy conservation strategy.

Oliff et al. (1999) found that most ungulates react more strongly (e.g., are more likely to flee, travel a greater distance) to a person on foot than a person on a snowmobile. Furthermore, stopping or getting off a vehicle creates more disturbance than a person on a continuously moving snowmobile. A few studies found that snowmobiles invoked a flight response or displaced deer from an area. Oliff et al (1999) observed flight response at distances no greater than 650 feet, while Freddy et al. (1986) observed reactions at distances less than 440 feet. Oliff et al. (1999) determined that their reaction was less intense when a visual barrier (i.e., vegetation and/or topography) was present. Eckstein et al. (1979) found deer were displaced from an area within 200 feet of snowmobile trails. Richens and Lavigne (1978) found deer were more likely to flee from snowmobiles traveling at high speeds than at speeds less than 10 miles per hour. They also propose that flight response to snowmobiles varied, depending on severity of winter, snow depth, type of cover, and time of day. Deer were more likely to flee from snowmobiles in early winter than in late winter possibly due to poor condition of deer toward the end of winter (Richens and Lavigne 1978). Deer are also more likely to be disturbed during early morning and evening when they are most active (Oliff et al. 1999).

A few studies showed that deer tend to use snowmobile trails as travel corridors between foraging areas and winter cover (within wintering areas) which may result in lower energy costs. Severinghaus and Tullar (1975) suggest that deer are not necessarily using trails to travel between productive forage areas, but instead concentrate foraging which contributes to over-browsing. They recommended keeping snowmobile trails at least 0.5 miles from deer wintering areas. Eckstein et al. (1979) also recommended that snowmobile trails avoid

deer wintering areas. They suggest that the effects of snowmobiles forcing deer off trails into deep snow would counterbalance any energy savings from compacted trail use. Huff and Savage (1972) observed white-tailed deer in Minnesota shifting the location used for winter cover depending on the level of snowmobile use. They found that deer utilized more desirable conifer (i.e., jack pine) areas with dense canopy cover during the middle of the week when snowmobile traffic was light, but shifted to a more open canopy aspen-birch stand during weekend heavy-use periods. They reported that radiant heat loss was higher in the aspen-birch stand than in the jack pine. On the other hand, a study conducted in Maine, suggests that snowmobile trails could be laid out in deer wintering areas in a way that could benefit deer, by improving their mobility, reducing energy costs, and providing access to better foraging areas (though snowmobile traffic was light in the study area) (Richens and Lavigne 1978).

Although moose are considerably better adapted to deep snow and winter conditions than deer, severe winters can still stress them if food supplies are exhausted or if they are in poor condition. Like deer, moose tend to reduce their activity levels in winter as an energy conservation measure, and disturbances that cause them to increase their activity come at an energetic cost. Collescott and Gillingham (1998) found that moose that bedded down within approximately 1,000 feet of an active snowmobile trail, or fed within 500 feet of snowmobile traffic, were likely to change their behavior in response to snowmobile disturbance. Moose within 1,000 feet of snowmobile traffic were sometimes temporarily displaced into less favorable foraging habitat. However, they did not find a significant impact on moose activity patterns within their study area associated with snowmobile traffic.

The studies above indicate that ungulates change their behavior in areas with active snowmobile trails. Ungulates are already operating at an energy deficit in the winter due to lack of high quality food (Picton 1999), and additional stress or disturbance can increase susceptibility to disease and predation, lead to higher mortality rates, and reduce productivity. Flight response is dependent on level of snowmobile use, speed, group size, and vegetative buffer between the trail and habitat being used. Within wintering areas, deer will use trails to travel between forage areas and thermal cover, although there is debate whether this saves deer energy or decreases their fitness level. Research conducted on predators, such as coyotes and bobcat, has shown that the packed snow associated with a groomed snowmobile trail network can allow easier travel (Buskirk et al. 1999), and potentially easier access to deer wintering areas. More than one study recommends snowmobile trails avoid deer wintering areas, though greater local investigations will be necessary to determine if trails are impacting wintering deer in the Nulhegan Basin. However, based on the long-term (i.e., 20 plus years) nature of the use and the absence of new forest openings, potential disturbance to wintering deer on the division from noise or visual stimulation from snowmobiles is likely not widespread. According to VFWD, the existing trail network generally avoids the core wintering habitat (C. Alexander, pers. comm.).

## Black Bears

Black bears will abandon den sites if humans on foot disturb them sufficiently, and may abandon cubs (Goodrich and Berger 1994). Bears that abandon or change dens may remain active longer and experience more weight loss than undisturbed animals. Bears are particularly vulnerable to disturbance just before denning (generally November through December), and just after they emerge from dens in the spring (March through April) (Oliff et al. 1999), periods generally outside of the snowmobile season. Because of this, we do not expect greater than negligible impacts on black bears from snowmobiling on the division.

## Other Carnivores (fisher, marten, weasels, red fox, coyote)

Little research has been done on disturbance effects on any of these species. However, fishers do not appear to alter their activity significantly in response to moderate levels of human disturbance (Oliff et al. 1999). Weasels and marten frequently tunnel under the snow when foraging. Snow compaction caused by snowmobile trails may affect their foraging ability locally, as well as negatively impact their small mammal prey.

Neumann and Merriam (1972) found that red foxes exhibited greater levels of activity near snowmobile trails and were using trails as travel corridors. Coyotes increase their use of snowmobile trails during severe winters as well (Crete and Lariviere 2003). In contrast to Buskirk et al. (1999), Kolbe et al. (2007) found that compacted snowmobile trails did not significantly influence the movements and foraging success of coyotes during the winter. We do not expect measurable impacts to these species given that snowmobiling occurs only on designated trails, most of which overlay a road network, and occupying only a fraction of the division's acreage.

## Other Mammals (snowshoe hare, small mammals)

Neumann and Merriam (1972) found that hare activity was reduced within 250 feet of snowmobile trails. They also found that a single passage of a snowmobile could significantly alter the insulating properties and temperature gradient of snow to a depth of two feet. Those changes in temperature regime were potentially great enough to increase energy costs to small mammals burrowing under the snow.

Jarvinen and Schmid (1971) found a significant increase in mortality of small mammals in an area where snow had been compacted experimentally by snowmobiles. Small mammals did not appear to migrate off-site in response to snowmobile activity. They suggested that causes of mortality might have been related to the reduced insulating capacity and increased thermal conductivity of the compacted snow which may have increased thermal stress on animals. Snow compaction may also have limited movement of animals and reduced the permeability of the snow to a point that inhibited gas exchange and increased levels of carbon dioxide above normal. On the division, such compaction is limited to the trail network, which generally corresponds to the road network. In contrast, if extensive off-trail snowmobile activity was allowed, resulting in compaction of large areas of snow, the impacts on small mammal populations may be significant (Olliff et al. 1999).

## Summary of Impacts to Wildlife

Anticipated impacts of snowmobile activity on refuge wildlife include displacement of wildlife immediately adjacent to trails and some potential for contamination of streams with sediment or exhaust. Snowmobiling is an ongoing use of the refuge and has been occurring at relatively consistent rates over the past 20 or more years. We would assess these trails and may reroute or close some of them if notable resource impacts seem likely. The use of well-constructed and maintained culverts and bridges over stream crossings helps to minimize the contamination of streams and impacts to aquatic life. Much of the disturbances to wildlife noted in literature are from snowmobiles that are not on designated trails and are traveling across open range habitats in unpredictable ways. Restricting snowmobile traffic to designated road corridors helps to increase predictability and wildlife habituation. The existing trails have been in place for decades and predate the establishment of the refuge. The snowmobile use at the division is currently at manageable levels based on monitoring studies, which supports our assessment that adverse impacts associated with this activity are expected to remain low.

***Impacts to visitors:*** Winter use of the division is overwhelmingly by snowmobilers. Compared to the greater than 10,000 snowmobile visits, approximately 300 people (mostly school groups) access the visitor contact station, and the Nulhegan River and Black Branch Trails receive an estimated fewer than 250 wintertime visits. Due to the placement of the SSTS and this other visitor use infrastructure, the distances between them, and topography, none of these other visitors along the division's southern boundary is affected by the sights, sounds, or smells of snowmobiles. Public scoping meetings conducted during development of the CCP recorded feedback from a segment of users interested in greater access to the division during winter months. In addition, VFWD suggested consideration of opening the VAST trails to skiers/snowshoers, as is the case on neighboring public lands. Due to the lack of observed conflicts between user groups on neighboring lands and in an attempt to offer consistent public uses across ownerships, we propose opening snowmobile trails to pedestrian uses in the corresponding CCP. Given their limited accessibility to plowed roads and layout, pedestrian use is expected to be light, although this would place the two user groups in closer proximity, thereby potentially increased opportunities for conflict.

Snowmobile noise is often considered a significant impact. A National Park Service study conducted in Yellowstone reported that a visitor on one of two heavily traveled trails, one of which is a major route to Old Faithful, would hear a snowmobile more than 50 percent of the time (US GAO 2000). Vermont regulations prohibit the operation of snowmobiles with noise levels in excess of 73 decibels on the A scale at 50 feet in a normal operating environment. Noise levels of snowmobiles on the division have been recorded in three separate investigations (Benoit et al. 2008). Decibel levels were found to increase with increasing speeds, ranging from 66 decibels at 15 miles per hour to 77 decibels at 45 miles per hour when measured 50 feet from a trail. Because of its basin formation, snowmobile sounds are often readily apparent within the trail network, although the sound does not reach the pedestrian trails or visitor contact station, all located along the southern boundary (USFWS pers. obs.).

***Summary of anticipated impacts***: Although the information available about the effects of snowmobiling on designated trails is somewhat mixed, at its current and anticipated levels and patterns of use as proposed, we do not expect it to constitute significant short-term or long-term impacts separately or cumulatively. We would evaluate all trails annually to ensure there are not site-specific impacts. We would reroute or close any trails if we determine that they have a significant, negative impact on wildlife or habitat.

Snowmobile trails are primarily located on existing roads. The location of the trails has effectively mitigated impacts of snowmobiling relating to soil and vegetation on those surfaces. The bridges and culverts crossing the water courses are designed to support trucks and other heavy equipment. Therefore, additional impacts from snowmobiling are unlikely. Snowmobile trails throughout the area have been established for many years and pre-date refuge ownership. Because the potentially affected wildlife is accustomed to this use and with the implementation of strategic trail segment closures, we consider disturbance-related impacts on wildlife to be minimal. More stringent emission regulations by the U.S. Environmental Protection Agency, along with the increase in the number of four-stroke and new cleaner two-stroke engines in modern snowmobiles has and will continue to reduce the potential impacts on the environment described in the literature review. The continued presence of refuge and partner agency law enforcement will ensure adherence to the stipulations that support the compatibility of this use. Therefore, snowmobiling on the division does not pose a risk to the goals outlined in our CCP. Continued monitoring of the use will identify any actions needed to respond to new information and correct problems that may arise in the future.

Snowmobile trails on the division provide an important link in the state-wide trail system, enhance opportunities for the public to experience the winter landscape, and facilitate priority public uses. This use as proposed is viewed as an effective, justifiable, and compatible method of winter access to the 26,605-acre division and the proposed 5,485-acre addition.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- In order to compensate for the proposed 1.4 miles of new trail construction, approximately 2.0 miles of existing trail will be closed:

  - Trail 114 between EX27 and EX271 (0.9 miles of “winter” or “grass” road) and approximately 1.1 miles of secondary trail C102/114 between EX22 and EX32 (one-half of a small loop) on the McConnell Pond tract (if acquired by the Service).

  - Such closures will only be implemented if and when the proposed new trail is completed and open to the public.

- The administration of snowmobile access and use on the refuge will comply with *50 CFR 27*, Title 23 of the Vermont Statutes.

- The administration of snowmobile access and use on the refuge will comply with Executive Orders 11644 (*Use of Off-Road Vehicles on the Public Lands*, February 8, 1972) and 11989 (*Off-Road Vehicles on Public Lands*, May 24, 1977), as summarized below:

* Specific areas and trails shall be designated where snowmobile use is either permitted or prohibited—Public snowmobile travel is restricted to designated corridors within the SSTS that are depicted on statewide and Essex County VAST trail maps available to the public, in the division Visitor Services Plan, and clearly marked with trail signs on the refuge. Roads, trails or other areas that are closed to snowmobile travel, but could reasonably be mistaken for areas open for travel, are clearly marked with closure signs. Guidelines governing use are available in the refuge *Visitor Services Plan* and will be incorporated into future refuge brochures, and refuge staff are available to the public in the office and on the refuge to answer questions and provide information about the use. Vermont regulations are available to the public in the *Vermont Snowmobile Operators Manual*.

* Designated areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands —The corridors open for public snowmobile travel are located primarily (greater than 98 percent) on existing gravel roads; the remainder are located on existing winter roads. Damage to soils and vegetation is minimized due to snow cover while use is occurring; damage to waters are minimized by trail location and stream crossings on bridges; damage to other resources (including cultural) is minimized due to trail location, snow cover, and management of the use.

* Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats—Such harassment is minimized because: (a) migratory birds (a Federal trust resource) are largely absent from the division during the winter; (b) many resident species are dormant or sequestered under ice or snow; (c) trails (encompassing a total of approximately 67 acres) do not traverse any significant concentrations of wildlife; (d) no functional winter deer shelter currently exists adjacent to approximately 6.8 miles of trails that occur within, or 2.7 miles of trails that occur on the border, of the Nulhegan Deer Wintering Area, and e) wildlife are presumed to have acclimated to motor vehicle travel on gravel roads underlying the SSTS for the past 50 years and to the spatial, temporal, behavioral predictability of snowmobile use as managed on the SSTS.

* Trails shall not adversely affect the natural, aesthetic, or scenic values of the lands —Such values are not significantly affected because: (a) snowmobile trails encompass only 67 acres of an approximately 32,000-acre division in linear openings already in existence as road corridors, ( b) due to topography, forest cover, and relatively narrow width, trails are not visible, or are indistinguishable, within most viewsheds of the division; (c) these lands have a 200-year history of human uses and the appearance of these trails is not inconsistent with the rugged character of the land and its cultural heritage, (d) surface impacts are not occurring that would affect scenic values in the non-snow season, e) summer/fall trail maintenance activities do not significantly or permanently damage vegetation, and on the greater than 98 percent of the trail system that occurs on vehicular roads, is necessary for public safety and proper maintenance, f) trail signs are temporary and generally non-obtrusive, and any litter resulting from the use is removed by the snowmobile clubs.

* Operating conditions shall be directed at protecting resource values, preserving public health, safety, and welfare, and minimizing use conflicts —(a) resource values are protected because dates are established within which snowmobile use can occur, site conditions must be suitable for operation of snowmobiles and groomers without causing damage and if conditions become unsuitable, trails are closed and use is discontinued and (b) public safety, health, and welfare are preserved and use conflicts are minimized due to: enforcement of applicable provisions of 50 CFR 27.31, Vermont Title 23, and Refuge requirements including designated trail system, imposition of speed limits, placement of safety and informational signs, noise level limits, vehicles must be in safe operating condition, reasonable and prudent operation is required, trail closures will occur based on unsafe conditions–in fact, with more than 10,000 visits per year, the first snowmobile-related injury was reported in 2012.

* Areas and trails where snowmobile use is permitted are well-marked and information about location and conditions for use are made available to the public —Public snowmobile travel is restricted to designated corridors within the SSTS that are depicted on statewide and Essex County VAST trail maps available to the public, in the division's visitor services plan, and clearly marked with trail signs on the division. Entrances to the division occurring on the SSTS are clearly marked with refuge boundary signs. Regulations governing use are available in the visitor services plan and will

be incorporated into future refuge brochures and other informational displays, and refuge staff are available to the public in the office and on the trails to answer questions and provide information about the use, Vermont regulations are available to the public in the Snowmobile Operators Manual. SUPs issued to VAST and local snowmobile clubs contain specific special conditions that govern their operation and use of the SSTS on the Refuge. Any SUP issued for access to private camps that are located on the division that are not situated on the SSTS define a specified route of travel minimizing off-trail travel and are for direct ingress/egress only.

* Provisions are made for law enforcement — A federal wildlife officer enforces applicable laws and regulations, provides visitor and resource protection, performs public outreach, monitors activity patterns, collects information on the use, and provides appropriate feedback to refuge management staff concerning snowmobile and other public uses. Additional assistance is provided by State and County enforcement officers.

* Effects of snowmobile use must be monitored — Snowmobile use and its effects are monitored through direct observations by refuge staff of trail use and user activity patterns and conduct, law enforcement patrols including speed monitoring and enforcement using radar detection devices, direct counts of snowmobiles, use of infrared traffic counters, observations of wildlife occurrence, behavior, and habitat use in the vicinity of the SSTS, monitoring of trail conditions and site impacts, detection of off-trail travel, and through awareness and evaluation of potential conflicts with other uses, refuge purposes, or management goals. A study of visitor use, including snowmobiling, by Southern Vermont College produced a visitor use summary, Northwoods Stewardship Center prepared an investigation of wildlife impacts, and VAST completed a study of the contribution of pollutants from snowmobiles.

* If it is determined that snowmobile use is causing considerable adverse effects on soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails, those areas must be closed until adverse effects are eliminated or preventative measures have been implemented to prevent recurrence — Special consideration must be given to managing this use to ensure that impacts of the use, user numbers, and user activity patterns remain within acceptable thresholds for resource protection and visitor safety (i.e., the use does not materially interfere with or detract from refuge purposes or the accomplishment of the Refuge System mission), as evidenced by evaluation of resource status through monitoring and results of studies. Should circumstances indicate that these thresholds are or will be exceeded, appropriate action, including, but not limited to, implementing snowmobile exhaust emission or engine noise limitations, requiring specialized equipment (e.g., four-stroke engines), modifying snowmobile use patterns, limiting snowmobile users and visits, and/or trail relocation or closure must be considered to ensure compatibility. Compatibility could be reconsidered when conditions under which this use is permitted change significantly, or if there is significant new information regarding the effects of the use.

- Providing for a safe use through proper administration and regulation, public education, and law enforcement will be essential. Refuge staff will continue to work with VAST and the local snowmobile clubs to develop the best system of signage for safety and regulatory information, minimizing the effects of trail maintenance activities, and reducing conflicts with other uses. Potential conflicts of snowmobile use with public safety, trust resources, wintering deer habitat, and other refuge resources, and management or public use programs will be appropriately mitigated in consultation with VAST, VANR, and the public.

## Special Conditions for Special Use Permit Issued to VAST and Local Snowmobile Clubs

Special conditions for the SUP (below) are designed to help ensure the compatibility of this use, reduce negative impacts to Refuge resources, provide for visitor safety, and minimize conflicts with refuge management and other uses of the Refuge.

(1) The Vermont Association of Snowmobile Travelers (VAST) and associated local clubs (Brighton Snowmobile Club, Northeast Kingdom Snow Blasters, and Canaan Border Riders), and their officers, agents, and assigns (hereinafter collectively referred to as "Permitee"), are authorized to use, provide for use, and maintain only those trails on the Nulhegan Basin Division of the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge) designated as part of the Statewide Snowmobile Trail System (SSTS) and depicted on the attached map. Snowmobile use is limited to the period from December 15 to April 15 and contingent on suitable snow conditions. Use of snowmobiles outside of the identified trails and time period is strictly prohibited. The Permitee shall notify all of its members of this condition. Permitee shall actively promote and encourage among users of the SSTS, compliance with all applicable laws, regulations, and policies governing snowmobiles and their use.

(2) In consideration of being permitted to engage in the activity authorized under this Special Use Permit at the Nulhegan Basin Division of the Conte Refuge, Permitee, for themselves and their personal representatives, heirs, and next of kin, hereby releases, waives, and forever discharges the United States of America, its agents and employees, all for the purposes herein referred to as, Releasees, from any and every claim, demand, action or right of action, of whatsoever kind or nature, either in law or in equity, arising from or by reason of any bodily injury or personal injuries known or unknown, death and/or property damage resulting or to result from any injury, which may occur while engaged in the permitted activity, and covenants not to sue the Releasees, for any loss or damages, and any claim or damage therefore, on account of injury to the person or property or resulting in death of the Permitee, whether caused by the negligence of Releasees or otherwise. Permitee agrees to indemnify, defend, save and hold harmless the Releasees and each of them from any loss, liability, damage or cost Releasees may incur due to the presence of Permitee in or upon the said property of the United States. Releasor agrees that this release and waiver is intended to be as broad and inclusive as permitted by the laws of the State of Vermont and that if any portion thereof is held invalid, it is agreed that the balance shall notwithstanding, continue in full legal force and effect. Permitee and its employees, designees, or associates shall indemnify against, and hold the United States of America, its agents and employees harmless from any and all claims, actions, suits, proceedings, costs, expenses, damages, and liabilities arising out of, connected with, or resulting from, the use by the Permitee and its employees, designees, or associates, or the privileges described, provided by this Special Use Permit.

(3) Permitee shall maintain said trails in safe, good, and useable condition and shall be responsible for placing and maintaining necessary signs, including speed limit and other safety-related signs as necessary to ensure adequate communication of safety information, trail conditions and features, speed limits, and trail restrictions to trail users.

(4) Maximum speed for snowmobiles will be 35 miles per hour. Speed limit signs on the refuge will be placed at all SSTS entrance points, at all trail junctions, and along all trails at approximately 0.5-mile intervals, visible from both directions of travel. Speed limit signs will be posted on their own stake/post; not share a post with any other signs. Two speed limit signs may be attached back-to-back on a single post, then posted on alternating right/left sides of the trail to meet the 0.5-mile and visible from both directions requirement as stated above. Additional signs such as "Road closed to snowmobiles," "Stay on Trail," etc., will be posted according to the map provided by the refuge, or upon verbal request by the refuge manager, or his designee.

(5) Signs may not be placed before **November 1** and must be removed before the **Memorial Day** weekend.

(6) Trails will be "opened" only after consultation with the Refuge Manager or his designee, following the placement of the required signage, and taking into account the snow conditions across the refuge, trail conditions on adjoining lands, and other refuge needs. The Permitee will not advertise refuge trails as "open" on their website or phone message line unless and until they are opened following joint consultation with the refuge manager.

(7) Failure to remove regulatory and directional signs by the Friday preceding Memorial Day will result in the Permitee being charged for the refuge's cost in so doing.

(8) Permitee agrees to patrol all of the refuge trails throughout the season of snowmobile use and at least once after snowmelt, and to pick up all trash and debris from trails and road shoulders and properly dispose of it off-refuge at an approved facility. The final collection and disposal of such litter shall occur prior to the Memorial Day Weekend.

(9) This Special Use Permit does not authorize the construction of new trails. Approved trails may be maintained by the Permitee, which includes signing trails, grooming snow-covered trails, replacing/repairing road culverts, replacing bridges, and the cutting and removal of trees, brush, and other obstacles from trails to a width of 15 feet. All trail maintenance activities must be coordinated with, and approved by, the Refuge Manager. All trees and brush leaning into the trail may be cut. Modification to the location of existing trails is not permitted without prior written approval of the Refuge Manager. Brush cutting, tree removal, and mowing activities will be performed only after August 1 unless otherwise approved by the Refuge Manager. Permitee may cut and remove standing trees for bridge construction where needed, but only with prior approval by Refuge Manager. Permitee agrees to pay standard prevailing rate for value of any merchantable timber removed.

(10) Permitee agrees to use pick-up trucks for trail maintenance whenever possible. The use of all terrain vehicles (ATV) for trail maintenance will be allowed only under the conditions of the S and only when and where the use of trucks is not feasible. Permitee will use every feasible precaution against causing surface damage to refuge roads, lands, and waters. Permitee will report any damages as soon as possible and will affect any needed repairs at the discretion of the refuge manager. Permitee shall assist the U.S. Fish and Wildlife Service to control illegal use of ATVs by informing ATV users they encounter that ATV use on the refuge is not allowed. Permitee shall not litter, or start or use open fires while engaged in the activities connected with this permit.

(11) Use of said property by Permitee shall be limited to noncommercial and nonprofessional recreational purposes and is further limited to such uses as are not in conflict with any applicable local ordinances or State laws including zoning ordinances and regulations. It shall be the sole responsibility of Permitee to obtain all necessary permits from any governmental authority or any instrumentality, agency or commission thereof to maintain or repair any trails and associated structures on the permitted property. Copies of any applications for such permits and approved permits shall be sent to the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service reserves the right to terminate this Special Use Permit in the event Permitee fails to obtain requisite permits or in the event Permitee maintains, modifies, or repairs trails that do not conform to the conditions contained on such permits. In addition, Permitee will at all times during the term of this permit or any extension thereof, observe and conform to all laws, ordinances, rules, and regulations now or hereafter made by any governmental authority for the time being applicable to said property and trails thereon or use thereof.

(12) The Refuge Manager reserves the right to close any or all trails or sections of trails when use of said trails by snowmobiles is determined to be not compatible or otherwise inconsistent or in conflict with the needs of the refuge or the National Wildlife Refuge System including, but not limited to, wildlife, habitat, and public use management by the U.S. Fish and Wildlife Service, its successors, assigns, administrators, licensees, and contractors; or because of inadequate snow, environmental damage, vandalism, or public safety considerations. The U.S. Fish and Wildlife Service will notify and discuss any problems with Permitee, and will consider establishment of alternative trails prior to closure of any trails.

(13) VAST shall provide annually, prior to opening day for the trail system, the Refuge Manager with a Certificate of Insurance evidencing that it has obtained and will maintain during the term of the Special Use Permit, Comprehensive General Liability insurance against claims occasioned by the actions or omissions of the Permitee, its members, agents and employees in carrying out the activities and operations authorized hereunder. Such insurance shall be in an amount commensurate with the degree of risk and the scope and size of such activities authorized hereunder, but in any event, the limits of liability shall not be less than $2,000,000.00 per occurrence. All liability policies shall name the United States of America as a named insured and shall provide that the insurance company shall have no recourse against the Government for payment of any deductible, premium, or assessment.

(14) Permitee will have in their possession a copy of this Special Use Permit and List of Special Conditions while engaged in the activities described therein and will present it to Refuge officials or law enforcement agents of United States or Vermont upon their request.

(15) Permitee will inform membership and users of the SSTS whenever/however feasible or practical to partake of interpretive information at the refuge kiosks while on refuge land.

(16) Permitee will designate one person from their club to be the point of contact (POC) for the Refuge Manager for all correspondence. Said person will provide their contact information to the refuge. The POC will maintain frequent communication as needed, but specifically, at the beginning and end of the snowmobile season in order to coordinate an unproblematic opening and closing of the trails.

(17) The U.S. Fish and Wildlife Service reserves the right to replace or rescind this permit at any time.

## JUSTIFICATION:

This use has been determined to be compatible provided the provisions of *50 CFR 27.31,* Title 23 of the Vermont statutes, Executive Orders 11644 and 11989, the recommendations of the GAO report, and Special Use Permit Conditions are implemented. This use is not expected to materially interfere with or detract from the mission of the Refuge System nor the purposes for which the Refuge was established. It does not materially interfere with or detract from the refuge purposes as follows:

- *To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish and wildlife.*

- *To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.*

  Snowmobiling at the Nulhegan Basin Division will not detract from these two purposes because most animals, especially most of the Service's migratory bird trust resource, are absent from the division in the winter and many resident wildlife species hibernate or remain under the deep snow cover; plants and ecosystems are protected from impacts by snow cover and the location of trails overtop roads; no significant negative impacts directly attributable to snowmobiling have been observed or documented on the division.

- *To protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 as amended (16 U.S. 1531 et seq.).*

  Canada lynx are the only federally listed species known to occur on the division. Based on the fact that lynx began occupying the division in the presence of snowmobiling, it is not likely that this use will cause undue disturbance to lynx. Although collisions with lynx are possible, it is not believed this is likely with enforcement of a 35 mile per hour speed limit and the fact that a negligible number of snowmobile-wildlife collisions have been reported or observed since Service acquisition of the division.

- *To restore and maintain the chemical, physical and biological integrity of wetland and other waters within the refuge.*

  Snowmobile crossings of water bodies are on bridges designed for passenger vehicle traffic; no significant negative impacts to waterways directly attributable to snowmobiling have been observed or documented in studies performed on the refuge.

- *To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.*

  Service trust species of migratory birds are largely absent from the refuge in the winter; of those that occur, no significant negative impacts directly attributable to snowmobiling have been observed or documented on the refuge.

- *To provide opportunities for…fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.*

  Snowmobile access provides an enhanced opportunity for the public to access the refuge to enjoy and experience the winter landscape and scenery and engage in wildlife-oriented recreation, including priority public uses, in support of this purpose.

This use will not pose significant short-term or long-term or cumulative adverse effects on trust species or other refuge resources, will not substantially interfere with public use of the refuge, nor cause an undue administrative burden. Our determination is based on existing, available information, including our own observations. Should we learn that there are adverse impacts we did not anticipate, either from monitoring the use or from other reliable sources, we will modify the use and the stipulations to avoid or minimize potential adverse impacts as swiftly as possible.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

## LITERATURE CITED:

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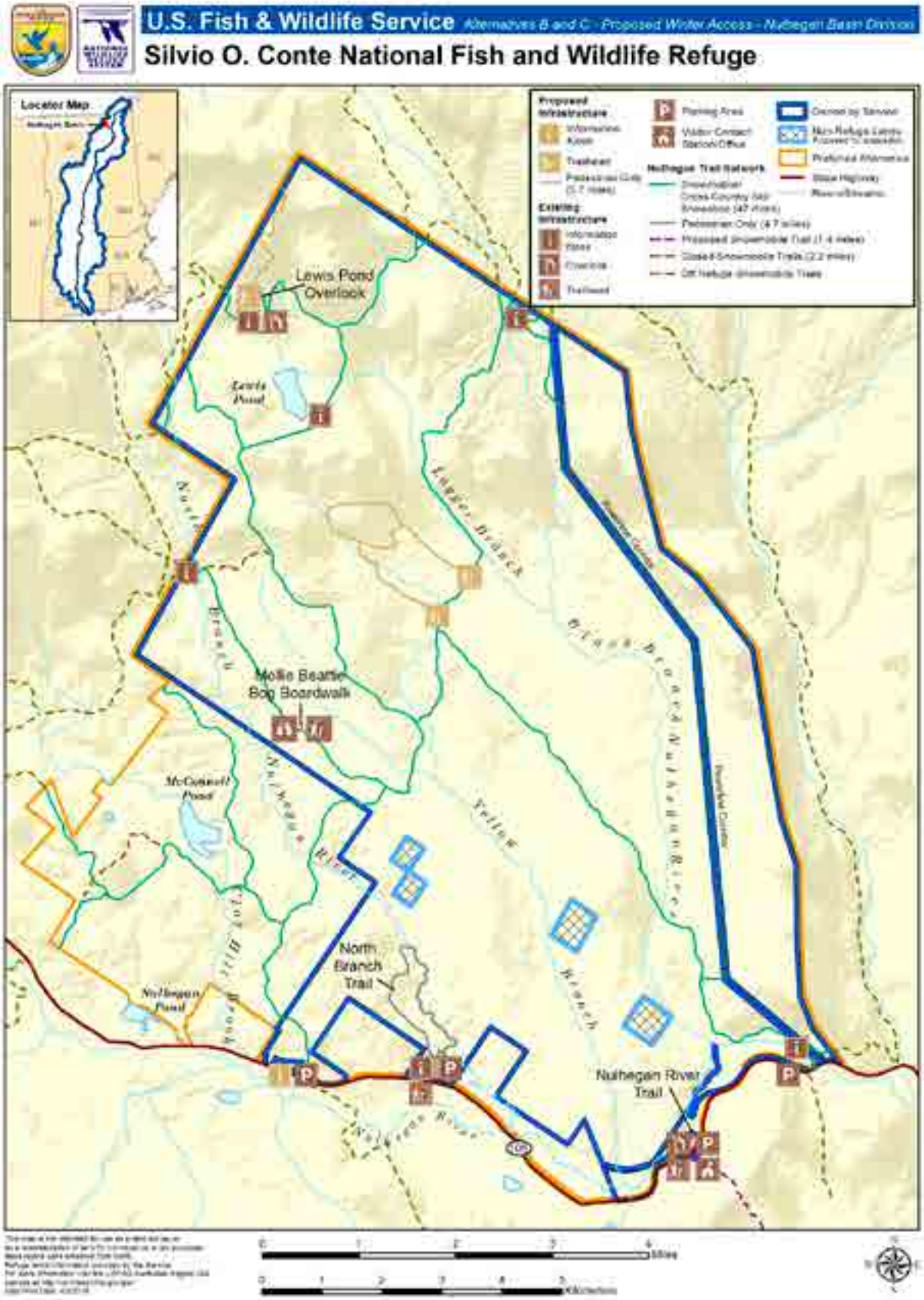
*Map D.5. Proposed Snowmobiling Trails at the Nulhegan Basin Division.*



**FWS Form 3-2319**
**02/06**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Snowmobiling on Designated Snowmobile Trails on the Pondicherry Division

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✔ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)? | ✔ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✔ | |
| (d) Is the use consistent with public safety? | ✔ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✔ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✔ | |
| (g) Is the use manageable within available budget and staff? | ✔ | |
| (h) Will this be manageable in the future within existing resources? | ✔ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✔ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✔ | |

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __✔__ No _____.

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** _____ **Appropriate** __✔__

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence:

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**603 FW 1**
**Exhibit 1**
**Page 2**

## JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

**Refuge Name:** Silvio O. Conte National Fish and Wildlife Refuge

**Use:** Snowmobiling on Designated Snowmobile Trails on the Pondicherry Division

## NARRATIVE:

The State of New Hampshire has over 6,000 miles of snowmobile trails, which are part of a more expansive regional trail network that includes parts of Vermont, Maine, and adjacent Canadian Provinces. The 3.7 miles of snowmobile trails on the Pondicherry Division are part of the State's "Snowmobile Trail Number 5." Also, a 3-mile section of the State Snowmobile Trail 102 crosses the refuge, but is owned and managed by the State. Snowmobile recreation is a popular winter activity in northern New Hampshire and it provides access to the refuge and can provide an opportunity for visitors to engage in wildlife-dependent recreation, particularly wildlife observation and photography. Specifically, snowmobilers often stop to view and photograph Cherry Pond and Moorhen Marsh that has a spectacular background of the Presidential Range.

The use is consistent with the refuge's goals and objectives to conserve the refuge's natural resources, because, due to the season of use, potential impacts to these resources are minimized because the ground is frozen and covered with snow and fewer species and fewer numbers of wildlife are present. Key winter habitat for most resident wildlife such as big game and gallinaceous birds (e.g., species of grouse) would be minimally affected by snowmobile presence on the Powerline Trail. Winter thermal cover for many species at the Pondicherry Division is composed of mature evergreen conifers, especially spruce and hemlock. Because this trail is completely within the managed power line corridor on the division, little impact to resident winter wildlife is anticipated.

This use may also contribute to public understanding of, and appreciation for, the refuge's natural resources by providing opportunities for participants to experience the refuge, see refuge habitats, and support wildlife-dependent recreation during winter when access to the majority of the refuge is otherwise limited.

We do not anticipate that the use will conflict with other refuge users. Although snowmobiles can have loud engines, the State of New Hampshire requires that snowmobiles comply with Snowmobile Safety and Certification Committee Standards, which include a maximum decibel-level for engines. Also, the level of pedestrian use on the refuge is relatively limited during the winter. However, the number of hikers, cross-country skiers, and snowshoers has recently been increasing on the refuge. The Mud Pond Trail parking lot, approximately one and a half miles from the snowmobile trail is the only parking area that remains open on the Division during winter and accounts for much of the increase in visitation. From here visitors can access the Americans with Disabilities Act (ADA)-compliant trail or explore the old logging road network on skiis or snowshoes. The section of snowmobile trail on the division is only a developed trail during winter; outside this season few people, other than hunters, use this utility corridor. Most skiers and snowshoers continue to use the 3-mile State-owned Presidential Recreation Trail to access the popular Cherry Pond area, because there is parking at the State trailhead and this rail-trail is the only groomed, direct access to this area. Noise from snowmobiles can be an annoyance to other visitors, but there are options to avoid the snowmobile trails and the two user groups have coexisted in this area long before the division was established.

For these reasons, we have determined that continuing to allow this use is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

# COMPATIBILITY DETERMINATION

## USE:

Snowmobiling on Designated Snowmobile Trails on the Pondicherry Division

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AUTHORITY

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## PURPOSE(S) FOR WHICH ESTABLISHED:

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## THE NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority public use?**
Public snowmobile access on established (as of 2013) State of New Hampshire snowmobile trails. This is not a priority public use of the National Wildlife Refuge System (Refuge System), under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997. This compatibility determination pertains only to non-commercial,

public snowmobile access on the Pondicherry Division; commercial snowmobile tours are a different use that would need to be considered separately.

**(b) Where would the use be conducted?**
New Hampshire has more than 6,000 miles of snowmobile trails which are part of a regional trail network that includes Vermont, Maine, and the adjacent Canadian provinces. Approximately 1,000 miles of trail are located in Coos County. The Pondicherry Division includes approximately 4.9 miles of New Hampshire Snowmobile Trail Number 5 on what is known as the Powerline Trail, located within a Public Service of New Hampshire (PSNH) power line corridor that enters the Division from the west and northwest in Whitefield, proceeds southeast to the Presidential Range Rail-Trail, then due east until it leaves the division near Jefferson Meadows (map D.6). The U.S. Fish and Wildlife Service (Service) owns this land in fee and PSNH has an easement on the utility corridor. At this time, only about 2.8 miles of the trail on the division is being actively used (see explanation below).

A 3-mile section of rail trail known as the Presidential Recreational Trail (State Snowmobile Trail 102)—owned by the State of New Hampshire and managed by the New Hampshire Bureau of Trails (Bureau of Trails)—lies within the Pondicherry Division boundary (map D.6). This is a non-motorized trail, except during the winter with snow cover when snowmobiles and all-terrain vehicles are permitted. Across the refuge, the railroad grade runs from the State parking lot on Airport Road north to Waumbek Junction, then east to Jefferson Meadows.

Historically, the snowmobile trail that crossed what is now the Pondicherry Division was located entirely within the utility corridor. The eastern half of this trail on thedDivision was relocated to the railbed east of Waumbek Junction after that railroad line was abandoned. Although the section east of the Presidential Recreational Trail is no longer active, the Bureau of Trails has requested that it remain an alternative to the currently used rail-trail route in the event of storm damage, flooding, forest management activities during the winter, or if that portion of the rail line is reactivated (Clinton Savage, Bureau of Trails, personal communication).

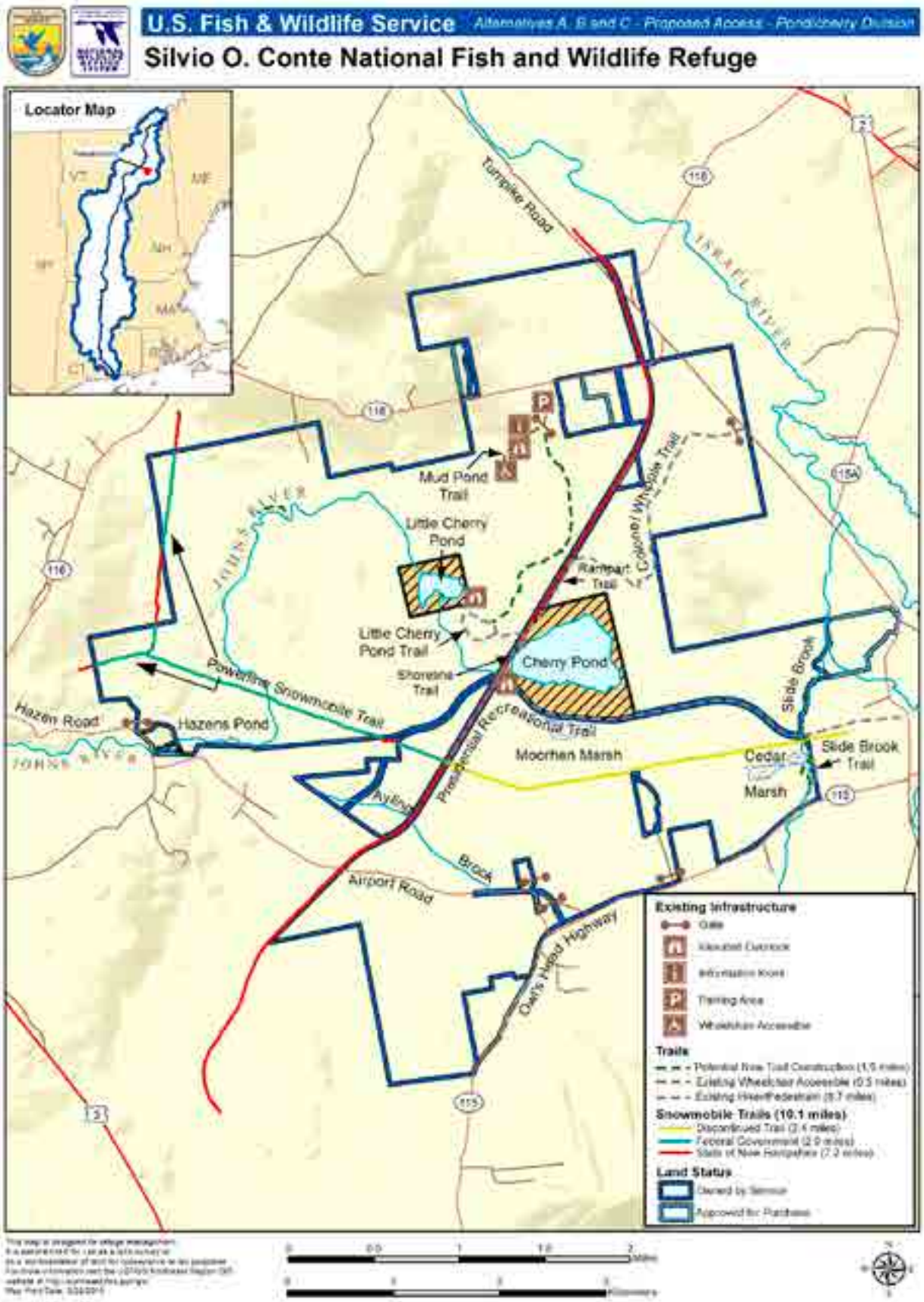
Assuming a 12-foot wide trail, approximately four acres or 0.06 percent of the division landbase is directly impacted by the active snowmobile trail. The snowmobile trail itself lies completely within the utility corridor which is maintained in an early forest succession/meadow habitat mix. Wildlife associated with these habitats during the snowmobile season includes a limited number of bird species because the migratory birds have moved to their wintering areas. Some species such as black-capped chickadees and downy woodpeckers that over winter on the Division, may spend some of their time in the power line corridor, but most winter residents are forest species. Black bears, reptiles, amphibians, bats, beavers, and fish may be found in the corridor, but typically these species are inactive or under ice during the snowmobile season. Species typically active during winter and potentially found in the power line corridor habitat include snowshoe hares, coyotes, and small rodents. No federally listed species are known to occur at the Pondicherry Division. Canada lynx tracks have been verified in the area and dwarf wedgemussels are in the Connecticut River which is approximately 8 river miles downstream from the division.

**(c) When would the use be conducted?**
Snowmobile use on the refuge would begin no earlier than December 1 and end no later than April 30. This minimizes conflicts with migratory and hibernating wildlife, and soil disturbance since snow cover is a prerequisite to opening the trail. Snowmobile access and trail grooming will be allowed during daytime and nighttime hours. Use outside of daytime hours (one-half hour before sunrise and one-half hour before sunset requires a special use permit (SUP). General trail maintenance activities such as brush cutting and down tree removal also may be performed occasionally during the late summer and fall.

**(d) How would the use be conducted?**
Snowmobilers at the Pondicherry Division must comply with New Hampshire Revised Statutes Annotated (RSA) 215:A, *Off-Highway Recreational Vehicles and Trails* which includes provisions for annual registration, manufacturing specifications, and rules for lawful operation on public and private lands. Individual snowmobile operators are required to obtain permission to use public and private lands, unless they are on an approved state trail, as is the case with the Powerline Trail.

In New Hampshire, snowmobiles must be registered annually with the New Hampshire Fish and Game Department (Fish and Game Department) unless they are exclusively used on the owner's land. Anyone not a member of a New Hampshire snowmobile club affiliated with the New Hampshire Snowmobile Association

*Map D.6. Snowmobile Trails at Pondicherry Division.*



must pay an additional thirty dollar fee to the State. The Bureau of Trails is responsible for administering funds used to maintain the state snowmobile trail system (New Hampshire RSA 215-A:3). Annually, funds derived from off-highway recreational vehicle (OHRV) registrations and non-refunded gasoline taxes are made available to local OHRV clubs by the Bureau of Trails through a competitive Grant-In-Aid Program. Local clubs use these funds for trail development, maintenance, construction, grooming, and safety improvements. A portion of the registration fees also support the Fish and Game Department programs in law enforcement, search and rescue, and safety education.

Snowmobile access and use on the Pondicherry Division also will comply with applicable federal regulations (50 CFR 27.31), and Executive Orders (11644 *Use of Off-Road vehicles on the Public Lands,* February 8, 1972; and, 11989 *Off-Road Vehicles on Public Lands,* May 24, 1977). An annual SUP will be issued to the Whitefield Sno-Kings for the purpose of authorizing snowmobile use, trail maintenance, and grooming on the Pondicherry Division. One stipulation of this permit is that the State of New Hampshire must carry $2,000,000 of general liability insurance for the snowmobile club.

The Whitefield Sno-Kings will be responsible for funding and carrying out maintenance and infrastructure repair to maintain a safe snowmobile trail on the division. They will install signage (e.g. trail number and speed limit) authorized by the Refuge Manager before the trail opens in winter, maintain those signs throughout the snowmobile season, and remove them when the season ends. The local club also is responsible for grooming the Powerline Trail on the Division throughout the snowmobile season. Grooming will generally be done at night with the frequency dependent on snow and trail conditions. During the late summer or fall, with prior approval in writing by the Refuge Manager, the club may prepare the trail for the upcoming season by cutting back woody vegetation and removing trees that have fallen across the trail. Under the permit, club members may use all-terrain vehicles (ATVs) solely to access the trail for maintenance and sign activities during the late summer or fall; however, they must secure permission by notifying the Refuge Manager at least 48 hours in advance.

We will allow snowmobiling generally following Bureau of Trails snowmobiling guidelines, where otherwise compatible and consistent with applicable Service laws, policy and guidelines. The refuge manager will continue to meet with the snowmobile club and the Bureau of Trails at least annually to discuss and reach agreement on planned activities and to review special use permit stipulations and conditions. Because clubs must secure landowner permission for construction and maintenance grants, the annual meeting also will serve to identify any up-front requirements for work on the division (e.g. compliance with the National Environmental Policy Act).

There are two snowmobile trails with the division boundary that were in existence prior to Service ownership. One of these trails described as a north-south trail between Quebec Junction and Waumbek Junction is located on an old rail bed owned by the State of New Hampshire (map D.6). The other is State Snowmobile Trail 5 (Trail 5) which enters the Division from the West in Whitefield and from the East in Jefferson. A North-South alternative route of Trail 5 is on the division for about 0.7 miles on the West side. This is considered part of Trail 5 and is wholly within the utility corridor. This trail enters the division on the western boundary in Whitefield and runs east within the utility corridor until it exits near Jefferson Meadows. Historically, this trail was located within the powerline corridor and the previous owners allowed snowmobile use; however, when the railroad line east of Waumbek Junction was abandoned, the State opened it to snowmobiles during the winter and pedestrians, equestrians, and bicyclists during the non-snow months. Now snowmobilers use the state rail-trail from Waumbek Junction to the eastern Division boundary.

According to SUP conditions, the snowmobile trail will not open prior to December 1 and will close on or before April 30, each year. The actual length of the season will be dependent on having enough snow cover to protect underlying soils and vegetation.

The speed limit for the Powerline Trail will be 45 miles per hour (mph). This is consistent with the speed limit on Snowmobile Trail Number 5 adjacent to the Division. A lower speed limit for the short section of trail on the Division would be confusing and is not warranted for safety purposes because the terrain is flat with extended sight distances. Regardless of the speed limit, snowmobile operation must be reasonable and prudent as described in Federal regulations (50 CFR 27.31) and State statute (RSA 215-A:6).

Staff began monitoring snowmobile use at the Pondicherry Division during the winter of 2007 to 2008. A traffic counter was installed on the trail to evaluate the frequency of use on a daily basis. Snowmobile use has been tracked for several years on the Powerline Trail. Table D.1 shows use for the period 2007 to 2013. The wide range of annual use is related to snow conditions. The best snow years were winters 2008-2009 and 2007-2008. In contrast, there were only 91 snowmobile visits in 2011-2012 because of poor conditions.

**Table D.1. Snowmobile Counter Data from the Powerline Trail.**

| Winter | Total Snowmobile Counts for the Powerline Trail |
|---|---|
| 2007-2008 | 5,861 |
| 2008-2009 | 6,659 |
| 2009-2010 | 2,780 |
| 2010-2011 | 1,024 |
| 2011-2012 | 91 |

**(e) Why is this use being proposed?**
As previously stated, snowmobiles within the refuge boundary are either on a State-owned or a refuge-administered trail (map D.6). Trail 5 is a State trail that extends from the Canadian border to Massachusetts. It also links to a larger network that includes trails in Vermont, Maine, and Quebec. Locally, it serves as a connection between the town of Whitefield and trails to Berlin, Randolph, and the Mount Washington area. The active section of Trail 5 that crosses the division is west of the rail-trail (map D.6). This snowmobile trail has been used for at least 30 years (personal communication, Clint Savage, New Hampshire Bureau of Trails). No habitat management is necessary with this section or the alternate route north because both are in the utility right-of-way. The only requirement is that sufficient snow is present to protect soil and vegetation.

The alternate route north is about 6 miles long with 0.7 miles on the division all within the utility corridor. Using this trail instead of Trail 5 proper saves about 17 miles of travel and the associated fuel consumption. It is unknown how many people use this trail, but snowmobiles are counted if they travel east into the division.

Observations by staff and the Friends of Pondicherry indicate that visitation to the division drops off substantially during the winter. People continue to use the Mud Pond Trail until snow or ice makes access difficult. The other trails, Colonel Whipple Trail and Little Cherry Pond Trail are not maintained in winter and only are used by a few visitors on skis or snowshoes. There also is dispersed skiing and snowshoeing. Although the number participants are unknown, it is not thought to be substantial. The most frequently used access in winter is the snowmobile trails which are also open to skiers and snowshoers.

The Pondicherry Division was identified as a Special Focus Area (SFA) in the Silvio O. Conte National Fish and Wildlife Refuge Final Action Plan and Environmental Impact Statement (USFWS 1995). At the time it was understood to be key wetland habitat for numerous migratory birds. More complete census information from the local birding community and refuge monitoring have documented at least 238 bird species on the division with 129 of these confirmed as breeders. The high concentrations and diversity of birds during the spring through fall seasons makes the division one of the richest bird concentration areas in the State. The entire Pondicherry Basin, which includes the Division, was designated the first Important Bird Area (IBA) in the State, in recognition of the area's importance to birds.

The vast majority of migratory birds found on the Division are breeders or migrants that move south to more temperate climates during the winter. Snowmobiling at the Pondicherry Division would be inconsequential to these species because there is no temporal overlap in use and habitat composition and structure would not be altered. Some species, such as chickadees, downy woodpeckers, and nuthatches, remain in the area yearlong. Most of these yearlong residents and birds that move to the area from farther north are forest dwellers that would be minimally impacted by the snowmobile trail in the utility corridor. There are some species such as snow buntings that are attracted to open habitats and occasionally are found in the area during winter. The utility corridor affected by snowmobile use represents only a portion of the meadow habitats on the division and in close proximity including the adjacent Mount Washington Regional Airport and agricultural lands.

Key winter habitat for most resident wildlife such as big game, gallinaceous birds (e.g. grouse) would be minimally affected by snowmobile presence on the Powerline Trail. Winter thermal cover for many species at the Pondicherry Division is composed of mature evergreen conifers, especially spruce and hemlock. Because this trail is completely within the managed power line corridor on the division, little impact to resident winter wildlife is anticipated.

There are benefits of allowing snowmobile use on the Powerline Trail across the division. From the State perspective closure of this trail would create a gap in a historically popular trail. The necessary rerouting would in all likelihood entail new road crossings and trail construction on private lands, if permission could be secured. It would also be considerably longer than the current, straight-line route. Moving this trail would result in alteration of habitats not currently impacted and be a significant expense to the State. The current trail location, in the utility corridor has minimal effect on habitat composition and structure, because the entire corridor is kept in a meadow/low shrub condition by PSNH for their transmission lines. Over the years, we have had an excellent working relationship with both the local snowmobile club and the State Bureau of Trails to refuge staff and it is to our advantage for this to continue.

Snowmobiling is a popular winter activity in New Hampshire and retaining this trail would allow introduction of the division, the Refuge System, and the Service to people that may not traditionally recreate on refuges. It also extends the Service's reach because people come from throughout the Northeast to snowmobile in northern New Hampshire.

One means of reaching snowmobilers is via an informational kiosk. We would work in cooperation with the other conservation partners (i.e. New Hampshire Bureau of Trails, New Hampshire Fish and Game Department, New Hampshire Audubon, and the Friends of Pondicherry) to construct an informational kiosk at the intersection of the Powerline Trail and Presidential Recreational Trail to facilitate outreach. This is a natural stopping location that will allow the Service and partners, to connect with a substantial number of riders through interpretive displays, brochures, fact sheets, and other pertinent information that will increase their understanding of the importance of this refuge and how it fits into the larger conservation efforts of the Service.

An unknown number of snowmobilers that enter the division engage in one or more priority public uses, particularly wildlife observation and photography. Moose, deer, and coyotes are active at the Pondicherry Division in winter and seeing them during a warm day would not be unusual. The southwest shore of Cherry Pond, near the State Rail-Trail, is a popular photo stop because the vista includes Cherry Pond in the foreground and a spectacular view of the Presidential Range in the White Mountains. Today, most snowmobilers probably do not even know they are on a national wildlife refuge, however, continued use of this existing trail through the division has the potential to cultivate support from a non-traditional public sector and give them an appreciation of the conservation importance of the Pondicherry Division.

## AVAILABILITY OF RESOURCES:

Sufficient refuge resources in terms of personnel and budget are available to administer snowmobiling on the refuge. The Pondicherry Division is approximately 3 hours from the Sunderland, Massachusetts headquarters, but New Hampshire Conservation Officers have the authority to enforce State regulations on national wildlife refuge lands and are the primary law enforcement agency for snowmobiling in the New Hampshire. This would be a continuation of how snowmobile laws and regulations were administered when the land was owned and managed by the previous owners. Conte Refuge shares a refuge law enforcement officer with the Umbagog National Wildlife Refuge and this officer spends part of his time in enforcement activities at the division. In addition, an active Friends Group keeps staff apprised of issues and opportunities based on their frequent visits to the Pondicherry Division. Conte Refuge staff will be responsible for onsite evaluations to resolve public use issues, monitor and evaluate impacts, maintain boundaries and signs, and meet with State officials, adjacent landowners and the interested public, when necessary. All costs for trail maintenance and repair are borne by the New Hampshire Bureau of Trails and carried out by the local snowmobile club under a refuge SUP.

Annualized costs associated with the administration of snowmobiling on the refuge are estimated below:

| Initial Costs | |
|---|---|
| *Document preparation/review/public comment* | $2,000 |
| *Supplies* (kiosk construction, brochures, kiosk notices) | $3,500 |
| *Traffic counter purchase* | $2,000 |
| *Law enforcement/responding to the public* | $3,000 |
| **Total Initial Costs** | **$10,500** |

| Annual Costs | |
|---|---|
| *Issue & Administer Sup* (GS-12 Refuge Manager) | $1,000 |
| *Refuge Law Enforcement* (GS-7 Park Ranger) *Shared with the Nulhegan Basin Division and Lake Umbagog* | $1,000 |
| *Resource Impact Evaluation* (GS-12 Refuge Manager) | $2,000 |
| *Visitor Contacts* (in sddition to Law Enforcement) (GS-12 Refuge Manager) | $1,000 |
| *Traffic Counter Maintenance/Data Collection/Analysis* | $1,000 |
| *Miscellaneous* | $500 |
| **Total Annual Costs** | **$6,500** |

The estimated costs listed above are primarily salary costs. Monitoring public use and providing law enforcement are required for properly administering public use programs; therefore, these operations are accounted for in budget and staffing projections. Additional law enforcement on the division is provided by Conservation Officers from the New Hampshire Fish and Game Department at no cost.

No special facilities or resources are needed to administer snowmobile use on the Pondicherry Division. There is no cost to the refuge for trail maintenance which is provided by the local snowmobile clubs with funds from the New Hampshire Trails Bureau. The Powerline Trail is not used during the rest of the year, so no additional maintenance considerations are necessary.

Based on a review of the budget allocated for recreational use management, we certify that annual funds are adequate to ensure compatibility and to administer and manage the recreational use described above.

## ANTICIPATED IMPACTS OF THE USE:

Potential direct negative impacts resulting from snowmobile use on State Trail Number 5 and the northern alternative route include habitat loss and damage, pollution, and disturbance to wildlife and other refuge visitors. A positive effect of allowing this type of access will be winter access for a segment of the public that may not otherwise spend time on the refuge. By constructing an informational kiosk at a traditional stopping location, these visitors will be exposed to educational panels and materials that will inform them of the division's role in wildlife conservation in the Connecticut River watershed and northern New England, the Refuge System, and the Service.

### Habitat Loss and Damage

The Powerline Corridor probably has been used since the 1970s, although the exact date of trail opening is unknown. This generally east-west oriented trail directly affects approximately 4 acres of land or about 0.06 percent of the refuge landbase. The entire trail is located in a 150-foot-wide utility corridor, which is maintained in a meadow/low shrub successional stage by PSNH. The direct loss of habitat is considered inconsequential because travel and trail grooming only commence when there is a sufficient snow pack. Trails are closed in the spring or during the season if patches of ground become exposed.

The most common impacts to vegetation attributable to snowmobiles are physical damage like bending and breaking when hit or run over (Stangl 1999). Additionally, plants are impacted during trail maintenance when

shrubs and sapling trees are trimmed back; however, similar impacts occur throughout the power line corridor where vegetative growth is retarded to protect the electrical lines. Trimming associated with the snowmobile trail is done by hand or with power brush cutters which sets back growth, but does not kill the plants. Brush cutting only occurs when woody plants encroach within the trail corridor or are tall enough to protrude above the snow surface. Plants in the snowmobile trail probably end winter dormancy later and are less productive than those that are unaffected (Stangl 1999). No federally or State-listed plants are known from the area encompassing the snowmobile trail. The amount of habitat directely affected by the snowmobile trail represents a small percentage of similar habitat in the powerline corridor on the division (8.0 percent), and of the division overall (0.06 percent).

## Soils

Soil temperature fluctuations are moderated during winter by a covering of snow. When this layer is compacted, as is the case with a snowmobile trail, soil temperatures are generally lower and freezing is deeper which can be detrimental to both plants and soil microbes (Douglass et al. 1999, Stangl 1999). Impacts depend on snow depth, traffic intensity, and soil and plant susceptibility. Bog soils and shrubs are particularly susceptible to these types of impacts (Stangl 1999). Compacted snow melts rapidly and has lower water holding capacities (Douglass et al. 1999), which can increase erosion during spring melt, particularly on slopes. Probable soil impacts on the Powerline Trail include compaction and possibly localized erosion. However, there is no perceptible evidence of substantial soil or plant degradation and erosion is minimal on this generally flat trail.

## Air Resources

Until recently, two-stroke snowmobiles with traditional carburetors were the only models available. Within the last few years manufacturers, responding in part to calls for quieter and cleaner burning snowmobiles, have brought direct injection, two-stroke and four stroke engines to market. Two-stroke engines are commonly preferred for their better power to weight ratio (Braven 2009), although advancements in four-stroke technology has improved their performance.

Two-stroke carbureted snowmobile engines emit pollutants, particularly hydrocarbons and particulate matter, through exhaust systems from an incomplete combustion of fuel and oil (NPS 2000, GAO 2000). Four-stroke engines are cleaner, but still produce similar levels of carbon monoxide and oxides of nitrogen (University of Wyoming 2000). A recent addition to the market has been direct injection two-stroke snowmobiles that emit fewer pollutants than the carbureted versions. In fact, these engines can cut hydrocarbon emissions by about 70 percent (NPS 2000).

According to information cited by the U.S. General Accounting Office (2000), the National Park Service concluded, primarily through analyses of studies in Yellowstone and Grand Teton national parks, snowmobiles caused increased levels of air pollution. At that time traditional two-stroke engines were the only versions readily available. On an average day in Yellowstone National Park during the 1990s over 700 snowmobiles entered the park (NPS 2000), with peak day with peak day use exceeding 2,000. The park averaged 66,619 snowmobile visits annual from 1992 to 1999. Up to one-third of the fuel can pass through the exhaust, unburned (University of Wyoming, Institute for Environment and Natural Resources 2000). Two-stroke snowmobiles reportedly produced 68 to 90 percent of the hydrocarbons and 35 to 69 percent of carbon monoxide emissions at those parks during the winter (NPS 2000). In response to concerns including air pollution, Yellowstone National Park is in the process of developing a long-term plan for winter operations, including snowmobiles (NPS 2013).

A study cited in the Final Comprehensive Conservation Plan and Environmental Impact Statement (CCP) for the Little Pend Orielle National Wildlife Refuge (Little Pend Orielle Refuge) in northeastern Washington stated that average snowmobile emission per hour is 216 grams of hydrocarbons and nitrous oxide and 564 grams of carbon monoxide per horsepower (USFWS 2000). Reportedly, a 54-horsepower two-stroke, carbureted snowmobile engine was estimated to emit approximately 360 times as much pollution per hour as an automobile. It should be noted that this information is based on the higher polluting, traditional two-stroke engines.

Other studies cited in the CCP claimed that such air pollutants can result in foliar injury, reduced productivity, tree mortality, decreased growth, altered plant populations, modifications in species diversity, increased susceptibility to pests and diseases, and pollutant depositions that melt into streams during spring snow melt.

Neither the exposure levels nor duration necessary to cause these effects were stated. These impacts were derived from a literature source and the CCP does not say whether these impacts were evident on the refuge.

The amount and impact, if any, of snowmobile emissions at the Pondicherry Division have not been studied. Neither have the effects of snowmobile exhaust emissions on habitat or wildlife, but the types of vegetative impacts described in the Little Pend Orielle Refuge CCP are not evident at Pondicherry. Annual snowmobile traffic at the division has varied from a high of 6,659 in 2008 to 2009 to a low of 91 in 2011 to 2012. These levels are substantially lower than those reported for Yellowstone, where, outside of the high concentration areas around West Yellowstone and Old Faithful, snowmobiles were not substantially affecting atmospheric deposition of the principal pollutants (Ingersoll 1998). This author reported diminished levels of carbon monoxide, a primary emission compound from two-stroke snowmobiles, at monitoring stations 20 and 100 meters from park entry points. The influence of snowmobiles on air quality is expected to diminish in the future because viable alternatives to higher polluting two-stroke snowmobiles are becoming more popular.

Pollutants are emitted by snowmobiles using the Powerline Trail. There is no evidence of chronic air pollution, similar to what was described for a high elevation site in Wyoming (Musselman and Korfmacher 2007). Undoubtedly, frequent winds dispersed pollutants more rapidly at their Wyoming study area, but dispersion also appears to be relatively quick at Pondicherry.

## Aquatic Resources

The impacts of snowmobile exhaust on aquatic systems have not been well studied, but fish can acquire and accumulate hydrocarbons (Ruzycki and Lutch 1999). Adams (1975) found hydrocarbon levels and lead to be at high levels the week after ice out in a Maine pond where snowmobiles were driven over ice during the previous winter. Lead no longer is an additive in gasoline, and therefore, not a concern. Repeated packing of snow during grooming can accumulate pollutants on developed trails which are then released during spring runoff (Ruzycki and Lutch 1999). The effects of snowmobile exhaust on aquatic invertebrates have received little attention. Currently, the open section of the Powerline Trail only crosses a small drainage, Ayling Brook, north of the Mount Washington Regional Airport. This stream may support a fishery, but undoubtedly has an invertebrate population. Four streams cross the inactive trail east of Waumbek Junction. At least one of these, Slide Brook, has resident fish.

Water pollution from snowmobiles is certainly a concern, but the traffic at Pondicherry is considerably less than the study sites discussed in Olliff and Kaeding (1999). The industry movement toward less polluting snowmobiles will reduce threats to aquatic systems. Strategic monitoring may be warranted to evaluate snowmobile contributions to water pollution. The current water quality concern at the division is mercury levels which have been detected in bass from Cherry Pond, but this heavy metal is not a by-product of engine combustion.

## Disturbance to Wildlife

Winter is a particularly stressful period for resident wildlife in northern latitudes due to severe weather, limited food resources, the energetic costs of moving through snow, and in some places, thermal cover limitations. Disturbance from any source during winter can tax energy reserves and be a contributing factor to winter mortality and affect reproduction. Several factors influence the impact of disturbance including timing, frequency, duration, and extent; physical condition of the individual animal; weather; habitat, particularly thermal cover, forage availability, quality, and spatial arrangement; and snow conditions. Late winter and early spring snow storms can be lethal, especially to pregnant females and those that are old, young, or in poor health.

Although individual animals certainly come into visual or auditory range of snowmobiles on the division and react by moving back into cover, there is no evidence to suggest that wildlife populations are being negatively affected. No specific evaluation of disturbance has been done at the Pondicherry Division, but a study of wildlife use in the vicinity of snowmobile trails at the Nulhegan Basin Division located in Essex County, Vermont, was recently completed (Benoit et. al. 2008). This work detected some differences in wildlife use near active snowmobile trails and unused trails, but the results were inconclusive because of confounding difference in snow accumulation between the two study years (2005 and 2008) and the habitat type adjacent to trails.

Some of the potentially negative effects of snowmobiling and other winter recreational activities on resident wildlife include:

1. Energetic costs of displacement by recreationists (Picton 1999). Herbivores, especially ungulates, operate at an energy deficit depending on stored body reserves during winter because high quality food is not readily available. Additional stress caused by recreationists flushing them from winter habitat can increase susceptibility to disease and predation, lead to higher mortality rates, and reduce productivity.

2. Displacement of animals into marginal or ineffective habitat (Clark and Wiseman 1999). High quality winter habitat is a key to survival for many herbivores, because of the close proximity of thermal protection and forage. Actions that cause animals to move to marginal habitats can lead to increased energy consumption during cold periods; increased travel distances for forage, decreased nutritional intake and reductions in thermal efficiency. Each of these can contribute to higher mortality rates.

3. Animals that are disturbed may alter their daily activity patterns leading to increased energy consumption and higher risk of predation (Clark and Wiseman 1999).

4. Direct mortality from collisions with snowmobiles.

Snowmobiling can have a limited, beneficial influence for some wildlife. Compacted snowmobile trails often serve as travel corridors because they are easier to walk on than adjacent deep snows. This was observed anecdotally in the study at the Nulhegan Basin Division (Benoit et. al. 2008). These trails may increase the probability of predator-prey confrontations. Snowmobile trails may allow some species to exploit new areas during winter. For instance, the compacted snow on trails appears to be necessary for coyotes to inhabit areas with deep snow (Bunnell et. al. 2006). This probably contributed to occupation of marginal habitats in the Northeast (Crete and Laiviere 2003) and a breakdown in spatial segregation of Canada lynx and coyotes during periods of deep snow (Bunnell et. al. 2006) where the two species overlap.

Most of the recent research of the effects of snowmobiling on wildlife and habitats has been conducted in the Greater Yellowstone Ecosystem (e.g., Olliff et al. 1999, Caslick 1997a, White et al. 2006). The conditions under which these studies were conducted including the number of snowmobiles per day (i.e. over 1,000 on a busy day) (Sacklin et al. 2000), affected habitats, and even species studied (e.g. bison and elk) may not have direct applicability to the Northeast and the Pondicherry Division. Older research was limited to studying two-stroke, traditional carburetion snowmobiles that used leaded fuel. These machines are much noisier than newer models and emit more pollutants, which at the time, included lead. Although that type of snowmobile is still the most common, newer direct-injection and four-stroke engines which are much less polluting are becoming more popular. So the application of the body of work on snowmobiling effects may not always be relevant to the situation at Pondicherry.

Most wildlife-related research has been limited to studying the effects of snowmobiling on individuals, then extrapolating potential impacts to populations. There has been little work done on the influence of snowmobile use on population dynamics. Although no direct research has been done on winter recreational effects, including snowmobiles, at Pondicherry, the New Hampshire Fish and Game Department completed its 10-year management plans for moose, white-tailed deer, bear, and turkey (New Hampshire Fish and Game Department 2005). Their monitoring and management indicates that big game populations in northern New Hampshire, where there is a widespread network of snowmobile trails, are stable or increasing.

Most of the Federal trust species for which the division was established (e.g. neotropical migratory birds, waterfowl, American woodcock) are on winter ranges well before the start of snowmobile season and do not return in the spring until after the trails close. The trail on Service-owned land does not intersect any habitats that would serve as winter concentration areas.

Snowmobile travel on and through the division is limited to the established snowmobile trails (i.e. Powerline Trail and the State-owned Presidential Recreational Trail), confining disturbances to a specific area. The timing, location, and occurrence of snowmobile use are fairly predictable which allows wildlife to habituate (Biel 1999, Freddy et al. 1986). At least one study found that heart rates increased whenever snowmobiles were present with no apparent habituation (Moen et al. 1982), although the implications to survival were not assessed. Trail maintenance with a groomer occurs at night when conditions warrant. Assuming the use of the powerline corridor for wildlife is compromised by snowmobile use, the total area impacted is approximately 89 acres (150 feet wide and 4.9 miles long), representing about 1 percent of the Pondicherry Division.

Wildlife that hibernate or go into a dormant state during the winter such as black bears, reptiles, amphibians are not directly impacted by snowmobile travel because use is limited to the trail in the utility corridor which affords little, if any, good winter hibernaculum habitat. Some small mammals (e.g. voles) remain active below the snow surface (i.e. subnivean habitat). The compacted snowmobile trail may be a barrier to their movement and can alter subnivean conditions such as lowering temperatures (Caslick 1997b). However, only a small portion of habitat at the division (0.1 percent) and in the utility corridor (8 percent) might be marginalized for these species. The snowmobile has a limited area of impact on small mammal populations that utilize the early succession/meadow habitats of the power line corridor.

## Impacts to Visitors

Snowmobile engine noise increases with the amount of traffic and proximity of the listener. Yellowstone National Park officials believed that snowmobile use conflicted with the solitude of Park visitors, and the noise had an impact on the natural quiet of the park setting (GAO 2000). Snowmobile noise levels have not been documented at the Pondicherry Division; however, New Hampshire regulations require compliance with the Snowmobile Safety and Certification Committee standards. The standard for a snowmobile at full throttle is 78 decibels plus 2 decibels at 50 feet and 73 decibels plus 2 decibels for snowmobiles moving at 15 miles per hour. These levels approximately equate to that experienced along a busy street *(http://www.asha.org/public/hearing/disorders/noise.htm)*. Snowmobile noise at Pondicherry is loudest near the intersection of the Powerline Trail and (Presidential Recreational Trail) where traffic from north/south and east/west meet. Although the sound is present to some degree on much of the refuge, attenuation reduces the levels so that if discernable, it becomes more of a background sound on the northern portions of the division. There are few, if any, areas of the Division completely devoid of motorized sounds because it is surrounded by public roads, including two State highways.

Currently, pedestrian visitors have limited developed access during winter. The only maintained trails within the division boundary are Presidential Recreational Trail and the Powerline Trail. People hiking, snowshoeing, or skiing have the option of using these groomed snowmobile trails, the Colonel Whipple and Little Cherry Pond hiking trails, the gravel portion of Mud Pond Trail, or the old logging road system. Many people choose the rail-trail because it the grade is flat and it is easy follow. However, skiing and snowshoeing on the existing hiking trails and old road system is becoming increasingly popular for people that want a more solitary experience. Having hikers and snowmobilers share a trail is not an ideal situation, but they have coexisted on this State trail for many years. These trails and the old logging road network help to spatially separate these two uses, giving people that seek more of a backcountry experience additional options at the Pondicherry Division.

## Summary of Anticipated Impacts

In summary, many studies identify and discuss snowmobile impacts to wildlife, their habitats, and other outdoor recreational users. Clearly, snowmobiles can have an effect on wildlife when the two are in close proximity. The typical reaction of wildlife is to move into cover to avoid the disturbance. Snowmobile use on the Pondicherry Division will be restricted to the Powerline Trail, the Trail 5 cut-across near the western boundary, and the State-owned and managed Presidential Recreational Trail. Based on available literature and monitoring at the nearby Nulhegan Basin Division impacts to wildlife are primarily to individual animals that come in contact with the trail when snowmobiles are present. Reactions are subject to a variety of factors, but there is no evidence that snowmobile use on the Powerline Trail will not have a deleterious impact on wildlife populations at Pondicherry, nor the federal trust species for which the division was established (i.e. migratory birds). At this time, based on professional judgment and the available information including the limited extent of the affected area, wildlife species present during the winter, and impacted habitats, regulated snowmobile use on the Powerline Trail does not materially interfere with or detract from the purposes for which the refuge was established or the mission of the Refuge System.

Snowmobile use does provide the public with an opportunity to enjoy and experience the winter landscapes and engage in wildlife-oriented recreation, including priority public uses, in support of refuge purpose number 6. It also gives the refuge a chance to inform a non-traditional visitor about the Pondicherry Division, Conte Refuge, Refuge System, and the Service. From the perspective of a snowmobiler and the New Hampshire Bureau of Trails, the trail on refuge property is an important connection to the trail networks that lie beyond the refuge boundary.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The administration of snowmobile access and use on the refuge will comply with 50 CFR 27 and New Hampshire RSA 215-A. The administration and management of the use as described in Section "(d)" above, and consideration, evaluation, and assessment of the impacts of the use as described in the "Anticipated Impacts of the Use" above, document our compliance with Executive Orders 11644 (Use of Off-Road Vehicles on the Public Lands, February 8, 1972) and 11989 (Off-Road Vehicles on Public Lands, May 24, 1977) as summarized below. Although these executive orders apply to off-road vehicles in general, this compatibility determination pertains exclusively to snowmobiling.

*(1) Specific areas and trails shall be designated where off-road vehicle (ORV) use is either permitted or prohibited.*

Public snowmobile travel on the refuge will be restricted to the Powerline Trail, part of State Snowmobile Trail 5 and the north-south alternative route on the western edge of the division which will be depicted on local snowmobile maps and signed on the division. There also will be signs that require snowmobilers to stay on the groomed trail. A map with this snowmobile trail will be posted on the informational kiosks, provided to local retail outlets, and given to local personnel of the New Hampshire Bureau of Trails and Fish and Game Department for distribution.

*(2) Designated areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands.*

The Powerline Trail and alternative route are located in a PSNH utility corridor easement. Snowmobile impacts to natural communities and native wildlife are limited because vegetation development and succession are periodically retarded to keep plants from growing up into the power lines. Damage to soils and vegetation is minimal because the ground is frozen and a snow cover must be present for the use to occur; damage to water is minimized because snowmobiles travel on a hard-packed snow cover, not across water; and, damage to other resources is limited by restricting snowmobile use to the established trails.

*(3) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats.*

Wildlife harassment is minimized because: (a) trust species (i.e. migratory birds) are generally absent from Pondicherry during the winter; (b) many resident species are dormant (e.g. black bears), under ice (e.g. beavers, muskrats, fish), or snow (i.e. subnivean wildlife); c) the Powerline Recreational Trail does not intersect areas or habitats with significant concentrations of wildlife, including deer winter yards; and, (d) most active wildlife species during the winter are presumed to have acclimated to snowmobiles traveling through the powerline corridor during the past 30 plus years. The restricted area available and predictability of use, in time and space, make it reasonable to assume that resident wildlife populations have adapted to this long-term use.

*(4) Trails shall not adversely affect the natural, aesthetic, or scenic values of the lands.*

Neither the Powerline Trail nor the alternative route will measurably affect the natural, aesthetic, or scenic values because: (a) The amount of land directly impacted by the active trail is about 4 acres or about 0.6 percent of the 6,405-acre division; (b) The trail lies completely within a 150-foot utility corridor easement where

vegetative succession is retarded to keep trees from interfering with the power lines. The visual appearance of the meadow-like corridor is markedly different than the surrounding forest. Thus the presence of the snowmobile trail in this unnatural setting does not detract from the natural, aesthetic, or scenic values of the refuge as a whole; (c) During the spring to fall seasons the trail is hard to discern in the meadow-like corridor. The snow pack required for snowmobiling protects the ground surface, and the mechanical treatment of vegetation on the trail itself does not permanently damage plants; (d) Trail signs are few in numbers and only up during the winter season; and, (e) Litter associated with snowmobiling is removed by the snowmobile clubs during and at the end of the season.

*(5) Operating conditions shall be directed at protecting resource values, preserving public health, safety, and welfare, and minimizing use conflicts.*

Resources values are protected because snowmobile operating dates require sufficient snow pack to protect soils and vegetation from being damage. Use is discontinued if conditions become unsuitable. Public safety, health, and welfare are preserved and use conflicts minimized through the applicable provisions of 50 CFR 27.31, New Hampshire RSA 215-A. Specifically, use is limited to the designated snowmobile trail, the State speed limit applies on this trail, noise level limits must comply with State regulations, vehicles must meet the Federal and State standards for safe operation, reasonable and prudent operation is required, and unsafe trail conditions trigger closure. Pedestrian visitors are not precluded from using the snowmobile trail. They can snowshoe or ski anywhere else at Pondicherry to avoid snowmobiles, including the network of logging roads.

*(6) Areas and trails where ORV use is permitted are well-marked and information about location and conditions for use are made available to the public.*

Recreational snowmobile use at the Pondicherry Division is limited to the Powerline Trail and the north-south alternative route, which appear on local club and State trail maps. An informational kiosk is located at the rail trail parking lot on Airport Road. The refuge will post a map of the division notifying snowmobilers that travel through the refuge is restricted to the Powerline Trail and the State's Presidential Recreational Trail, and that no off-trail travel is permitted. Standard State or refuge snowmobile trail signs will be posted at key points. Other entry points will have "No Snowmobile" signs erected, if necessary, to ensure people are aware that snowmobile use is not allowed elsewhere on the division. Updated trail conditions are available from the New Hampshire Bureau of Trails either by phone or on their web site. Visitors also can contact the refuge to find out about current conditions. SUPs issued to Whitefield Sno-Kings contain specific special conditions that govern their operation and use of the trail.

*(7) Provisions are made for law enforcement.*

The Pondicherry Division is unstaffed, but a law enforcement officer stationed at the Nulhegan Basin Division, approximately 45 minutes driving time, will patrol the snowmobile trail. Officers from the New Hampshire Fish and Game Department and Bureau of Trails have conducted law enforcement on this trail in the past as part of their normal duties, and will continue to do so on the division.

*(8) Effects of ORV use must be monitored.*

Snowmobile use on the refuge will be monitored and effects evaluated. Monitoring will be done via observations of trail use by refuge staff, state personnel, and members of the Friends of Pondicherry, a local volunteer group. Federal and State law enforcement patrols will help ensure that people comply with regulations to minimize biological and recreational conflicts. Empirical use data will be collected with a trail counter on the Powerline Trail. Condition of the trail itself will be evaluated at the end of each season and periodically during the season to ensure that unacceptable resource damage is not occurring.

*(9) If it is determined that ORV use is causing considerable adverse effects on soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails, those areas must be closed until adverse effects are eliminated or preventive measures have been implemented to prevent recurrence.*

As stated in Number 8 above, monitoring use of the Powerline Trail will be an ongoing process. Because there is only one trail on Service property at Pondicherry and it lies completely within a managed utility corridor, the primary resource concerns are impacts to soil, surface water, and resident winter wildlife. Both refuge staff and personnel from the Bureau of Trails will monitor trail conditions to ensure that there is sufficient

snow pack to support snowmobile use. The trail does not traverse any habitats key to wintering wildlife such as deer thermal cover; however, the trail will have limited effect on species that spend the winter under the snow surface in the utility corridor.

Should unacceptable resource impacts occur, appropriate action will be taken to alleviate problems. Actions may include more restrictive limitations on engine exhaust emissions or noise levels, limiting the number of snowmobiles on the refuge, and trail relocation or closure. These or other actions may be necessary in the future to ensure that snowmobile use of the Powerline Trail does not materially interfere with or detract from refuge purposes or the mission of the Refuge System, as previously described. Compatibility could be reconsidered before the term of this Compatibility Determination should the conditions change significantly, or there is new information regarding the effects of snowmobiling that warrants an updated evaluation.

The Powerline Trail is used specifically for snowmobiles. It does not serve as a hiking trail during other times of the year so there is no historical pattern of pedestrian use, except for snowshoers and skiers that may use it during snowmobile season. Snowmobiles are not allowed on any of the developed pedestrian trails on the division (map D.6).

*(10) Use outside of daytime hours (one-half hour before sunrise and one-half hour before sunset requires a special use permit.*

## JUSTIFICATION:

This use has been determined to be compatible provided the stipulations necessary to ensure compatibility are implemented, and the use does not exceed thresholds necessary for visitor safety and resource protection. This use is not expected to materially interfere with or detract from the mission of the Refuge System nor diminish the purposes for which the refuge was established, will not pose significant adverse effects on refuge resources, will not interfere with public use of the refuge, nor cause an undue administrative burden. signature:

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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# COMPATIBILITY DETERMINATION

## USE:

Furbearer Management (Trapping) on the Nulhegan Basin Division

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AUTHORITY

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## PURPOSE(S) FOR WHICH ESTABLISHED:

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## THE NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is it a priority public use?**
The use is furbearer management. We consider furbearer management to be a refuge management economic activity. It is not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997.

**(b) Where would the use be conducted?**
Furbearer management through trapping is allowed throughout the Nulhegan Basin Division (division), as well as additional adjacent lands acquired under the Comprehensive Conservation Plan's (CCP) preferred alternative (e.g., McConnell Pond tract). The division has been open to trapping since 2001and this activity occurred during the decades preceding U.S. Fish and Wildlife Service acquisition. Trappers are issued a special use permit (SUP) to trap on refuge lands, and to date, an average of three SUPs have been issued each year. Due to this light demand, trapping zones have not been established. Trapping occurs throughout the division, and would be allowed on new lands acquired as part of the division. However, this use would be evaluated on a yearly basis, and areas may be closed to trapping if it is determined that this management activity directly conflicts with other user groups or biological goals and objectives. If a conflict is observed, trappers would be notified and a special condition(s) to remedy the situation would be attached to the SUP.

**(c) When would the use be conducted?**
This activity would correspond to the dates established annually by the Vermont Fish and Wildlife Department (VFWD); the trapping season spans late-fall to mid-winter. Access to the division would occur 24 hours a day, 7 days a week.

**(d) How would the use be conducted?**
The furbearer management program is, and would continue to be implemented, through the SUP process and, if needed, the refuge would work with the VFWD to implement any special furbearer management regulations. Administering the program under an annual SUP would allow the wildlife refuge manager to have a ready list of contacts for requests for specific management needs to accomplish refuge objectives.

We will require a harvest report from each trapper following the close of the trapping season. The report includes data about the trapping effort (trap-days), the time span of trapping by species, the number of traps used, the number of target and non-target species harvested, the refuge areas trapped, and remarks on observations of wildlife or other noteworthy ecological information. This data is used to monitor potential impacts of this use on refuge populations of furbearers. If the required information is lacking for a trapper from the previous year, we will not issue the SUP for the upcoming season.

As specified in the Nulhegan Basin Division Furbearer Management Plan, trappers must follow State regulations and trapping seasons on refuge lands. Refuge-specific regulations are provided to each trapper under "special conditions" of the issued SUP. The refuge would allow furbearer management for the following target species: beaver, bobcat, mink, fisher, coyote, fox, muskrat, otter, raccoon, skunk, and weasel.

The wildlife refuge manager reserves the authority to regulate the numbers of target species taken in any one location as well as the number of trappers or number of traps per trapper allowed. If we determine that limits on the number of trappers is necessary, we would follow the procedures outlined in the Service's Refuge Manual (5 RM 17.11) and other applicable laws and regulations (see also 50 C.F.R. 29.1). Trappers, as with all visitors, are allowed off trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

Due to the confirmed presence of Canada lynx on the division, VFWD in 2014 enacted new trapping regulations for Wildlife Management Unit E, which includes the division. These new regulations are responsive to increased presence of lynx and require setting traps in a manner and location that are inaccessible to Canada lynx.

**(e) Why is this use being proposed?**
Trapping on refuges is considered a refuge economic use, per Service policy (603 FWS 2, part 2.6 (N)). As per 50 C.F.R. 29.1, we may only allow economic uses of a refuge natural resource where the use contributes to achieving refuge purposes or the Refuge System mission. We would conduct furbearer management: (1) as a wildlife management tool that can maintain sustainable populations and habitat quality, (2) as a mechanism to collect species information that otherwise would be expensive and difficult to obtain using refuge resources, and (3) as a way to maintain a data set that may lead to research on furbearer (and other wildlife) occurrence, activity, movement, population status, and ecology. By maintaining a trained, experienced group of trappers, the Service can use their skills and local knowledge to perform or assist in valuable management or research

functions. Trappers could potentially provide assistance with the implementation of structured management objectives, such as the alleviation or reduction of wildlife damage conflicts, negative interactions among species, and habitat modifications.

A trapping program also fosters the appreciation of wildlife and nature, wildlife observation, a greater understanding of ecological relationships, stewardship of natural resources, and inter-generational transfer of the methodologies of renewable resource use. Trapping is an activity in which family members and friends often participate and share joint experiences that broaden appreciation of natural resources and ecological awareness (Daigle et al. 1998).

## AVAILABLITY OF RESOURCES:

The financial resources necessary to provide and administer this use at its current level are now available, and we expect them to be available in the future. The wildlife refuge manager would provide overall administration of the program. A wildlife biologist would be required to evaluate furbearer activity, potential and current impacts on refuge resources, and potentially prescribe harvest objectives or quotas. The biologist would also evaluate trapper data, compile trapping reports, and help process SUPs. The refuge's federal wildlife officer, in coordination with other law enforcement agencies, would check refuge trappers and ensure compliance with State and refuge regulations.

A breakdown of the projected annual cost of the trapping programs is shown below:

| | |
|---|---|
| *Law Enforcement and Monitoring:* | $1,000 |
| *Biological staff time* (program oversight): | $600 |
| **Total:** | **$1,600** |

## ANTICIPATED IMPACTS OF THE USE:

The impacts of furbearer management on the purposes of the refuge and mission of the Refuge System can be either direct or indirect, and may have negative, neutral, or positive impacts on refuge resources. Direct effects of trapping include the removal of individuals of target (i.e., furbearer) and potentially non-target species. Indirect impacts include reduced production among migratory birds resulting from disturbance during the pair bonding/nesting season, increased recruitment of birds as a result of removing predators of birds or their nests, or habitat change as a consequence of the removal of species that directly alter habitats (e.g., beavers or muskrats).

### Impacts to furbearers:

The impacts of the furbearer management program obviously include those on the furbearer populations themselves. Trapping harvests and removes individuals of the species. The anticipated direct impacts of trapping on wildlife would be a temporary reduction of furbearer populations in those areas where surplus furbearers exist. The removal of excess furbearers from those areas would maintain furbearer populations at levels compatible with the habitat and with refuge objectives, minimize furbearer damage to facilities and wildlife habitat, minimize competition with or interaction among wildlife populations and species that conflict with refuge objectives, and minimize threats of disease transmission to wildlife and humans.

VFWD considers harvested furbearer populations throughout the state to be stable with indices tracking within the expected ranges of these species' year-to-year cyclic variations (C. Bernier, VFWD, personal communication). Beaver, muskrat, fisher, and mink are the most common furbearers harvested from the division (Table D.2). Harvest reports show that an average of 14 beaver, 6 muskrat, 4 fisher, and 4 mink have been taken each year between 2001 and 2012.

**Table D.2. Harvest Summary for 2001–2012**

| Species trapped | Total number of individuals trapped | Total number of trap days |
|---|---|---|
| Beaver | 165 | 281 |
| Bobcat | 1 | 34 |
| Coyote | 31 | 54 |
| Fisher | 54 | 179 |
| Mink | 41 | 166 |
| Muskrat | 77 | 137 |
| Otter | 13 | 110 |
| Raccoon | 2 | 4 |
| Weasel | 8 | 10 |
| **Total for 2001–2012** | **392** | **975** |

A national program operated under the guidance of the Fur Resources Technical committee of the International Association of Fish and Wildlife Agencies (IAFWA 1998) systematically improves animal welfare through trap testing and the development of "Best Management Practices (BMPs) for Trapping Furbearers in the United States." The refuge would cooperate with and contribute to the development and implementation of those BMPs by practicing an integrated, comprehensive approach to furbearer management, wherever and whenever possible.

## Impacts to Canada lynx:

Canada lynx are the only documented federally listed species to occur on the division. The historic record of Canada lynx occurrence in Vermont is scant; there are only five records of lynx from the period 1797 to 1968, and there is no historical evidence of a breeding population (Kart et al. 2005). Recent lynx occurrence in Vermont has been documented since 2006, and breeding was first documented in 2009. To date, evidence of lynx reproduction in Vermont (corroborated via the genetic testing of biological matter collected during winter track surveys) has been documented in 2009, 2011, and 2012; all instances at the division (R. Cliche, USFWS, pers. comm.). Based on these sightings and other survey work conducted within the State, the division is thought to support Vermont's only known population of breeding lynx.

Lynx require boreal forest landscapes supporting a mosaic of differing successional forest stages that contain snowshoe hares and their preferred habitat conditions. Such conditions include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface; winter conditions that provide and maintain deep fluffy snow for extended periods of time; sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range (Federal Register 2013).

Canada lynx populations are dependent on landscapes containing relatively high snowshoe hare populations. However, snowshoe hare populations are prone to cyclic changes in abundance with years of high snowshoe hare abundance being followed by population crashes that result in years when they are relatively scarce. During these times of low snowshoe hare abundance, Canada lynx may cease reproducing or even abandon areas (Federal Register 2013).

As demonstrated by recent breeding records in northern Vermont, the physical and biological features essential to lynx are present in sufficient quantity and spatial arrangement to support several lynx home ranges, at least temporarily. However, because Vermont is located at the species' southern range limit, it remains uncertain whether the area contains the features in adequate quantity and spatial arrangement to support a persistent population. Based on their recent arrival and lack of historic information, we expect the lynx population at the division to be ephemeral.

As a furbearer, lynx are susceptible to incidental capture in traps set for other species. In order to address the potential for incidental capture or harm, VFWD enacted several regulations effective January 1, 2014 (*http://www.vtfishandwildlife.com/newrules/Hunting_and_trapping/2013_Lynx_Regulation_Annotated.pdf*). These regulations establish a lynx management zone, encompassed by Wildlife Management Unit E, which includes the division. The regulations address proper notifications should a lynx be captured and they establish methods of setting traps designed to exclude lynx from accessing a trap. It is reasonable to expect that adherence to these practices are sufficient to minimize the incidental capture of Canada lynx.

## Northern Long-eared Bat:

The northern long-eared is listed as federally threatened and State-endangered due to similar white-nose syndrome-related population declines. This is a forest-associated bat that roosts in dead and dying trees. Summer mist-net surveys conducted in nearby Charleston, Vermont captured this species. We anticipate that furbearer management will have no effect on northern long-eared bats, but we will continue to consult with Service endangered species staff with the New England Field Office to ensure there are no negative impacts to this species.

## Impacts to other wildlife:

Non-target species could be captured incidentally through this trapping program. Traps will be set specifically within areas of targeted species activity to reduce the risk of taking species other than targeted species. The experience of the trappers, use of species-appropriate techniques, and the selection of the appropriate trap size will reduce non-target captures (Northeast Furbearer Resources Technical Committee 1996, Boggess et al. 1990). The VFWD requires trappers to check traps once daily, unless traps are set in the water (body traps) or under the ice (body and foot traps) for beaver. This decreases the risk of exposure to the elements, predators, and stresses for animals in traps, and increases the success of releasing an uninjured non-target species.

Trappers may temporarily disturb wildlife while driving the division's roads and walking to their trap sets. Disturbances will vary by wildlife species involved and the type, level, frequency, duration, and the time of year activities occur. Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. In this study, common species (e.g., American robins) were found near trails and rare species (e.g., blackburnian warblers) were found farther from trails. In some cases there is a clear link between the extent of disturbance and either the survival or reproductive success of individuals (e.g., Schulz and Stock 1993), but in many cases disturbance acts in a more subtle way, by reducing access to resources such as food supplies or nesting sites (Gill et al. 1996). Bird flight in response to disturbance can lower reproductive success by exposing individuals and nests to predators. For recreation activities that occur simultaneously (e.g., hiking, biking) there will likely be compounding negative impacts to wildlife (Knight and Cole 1991). However, because of the temporal separation of trapping activities (i.e., fall/winter) and breeding wildlife using the refuge (i.e., spring/summer), disturbance of migratory birds by trappers would be negligible.

Although trapping has some negative effects, it also plays a large role in maintaining sustainable populations and lessens predation effects for certain species of interest. Trapping is used to maintain wildlife population levels that are immune to population crashes, produce the maximum sustained yield, maximize environmental benefits for species of management emphasis, reduce the spread of diseases within a population, or reduce wildlife damage. All of these goals often require furbearer populations to be maintained at a lower level than would otherwise be the case (Conover 2001). With a recent decrease in the price of fur, hunters and trappers have less incentive to pursue furbearers, leading to an increase in their populations. This could cause a decrease in the population of other key species like ground-nesting birds (Batcheller et al. 2000). Adjusting regulated trapping beyond surplus production contributes to a controlled additive mortality which will cause the population to decline. This lessens predation on rare, threatened or endangered species (NEFRTC 2001).

## Impacts to aquatic systems:

The topography of the Nulhegan Basin, with its dense stream network, is conducive to beaver activity. Although beaver-influenced wetlands have not been mapped, several are visible from roadways and when viewed from above, a meaningful percentage of the division is covered with open water (staff observations). Naiman et al. (1988) discuss the influence that beaver have over natural systems and the ecological changes that occur as colonization progresses. The alteration of stream channels and the mosaic of habitats created is readily

apparent at the division. Such a variety of habitats have great value to the Service's trust resources (e.g., migratory birds) as well as provide more generalized "ecosystem services," such as floodwater retention and enhancing nitrogen availability across the landscape (Naiman et al. 1988). Past records indicate that the beaver harvest is sustainable, and observations by staff of current beaver activity indicate that this species continues to persist in the presence of a regulated trapping program. It is, therefore, believed that continuation of such a trapping program will not adversely affect the division's aquatic systems.

## Conflicts with other public uses:

A program of regulated furbearer management on the division as described under this compatibility determination is not expected to conflict with other public uses. Conflicts with public uses are not expected because trapping is generally an inconspicuous activity, traps are usually hidden from view, and they are usually checked in the early morning when other visitation is low. Furthermore, the principal visitors at this time of year are camp leaseholder, hunters, and other trappers, who are long accustomed to this activity. These characteristics serve to limit the potential for encounters between traps or captured animals and those engaged in other public use activities.

## Beneficial effects:

Regulated trapping has been documented to provide a variety of ecological benefits including prevention and alleviation of habitat degradation, facilitation of habitat and wildlife restoration, reduction of predation on key species of management concern, protection of rare and endangered species, dampening of disease transmission and severity of disease outbreaks among wildlife and between wildlife and humans, maintaining the integrity of infrastructure, and the conservation and enhancement of biological and genetic diversity (Boggess et al. 1990, Organ et al. 1996).

It is sometimes necessary to reduce the furbearer population to limit damage to infrastructure. Certain furbearers have gradually become more of a liability (NEFRTC 2001). For example, beavers can dam culverts and outlets causing roads to flood following heavy rains and spring snowmelt. This prevents road access and increases the cost to repair damaged roads. Among local municipalities, many adjust trapping regulations in response to furbearer population changes and the public's desires (NEFRTC 2001). Trapping is an effective means to manage and monitor furbearer populations thereby minimizing infrastructure damages.

The eastern coyote is known to be a principal competitor of Canada lynx, sharing a similar prey base (Buskirk et al. 1999, Federal Register Vol. 65(58): 16051-16086). As demonstrated in past trapping records, the removal of approximately three coyotes each year by trapping may increase the availability of prey for lynx and thereby enhance the suitability of the division for lynx.

Regulated trapping is an important means to minimize the transmission of diseases for the benefit of both the wildlife and humans. A healthy population is one that exists within the limits that the habitat can support. If a population exceeds its carrying capacity, factors like starvation or disease can force a re-balancing. Disease in wildlife is often linked to a high population density allowing easier transmission of the disease through contact (Herman 1969). Some furbearer diseases, such as rabies, sarcoptic mange, raccoon roundworms, plague, murine typhus, tularemia, and salmonellosis can also affect humans (Cheng 1973). Trapping can help reduce the local density of furbearers which can decrease the potential spread of disease and contact with humans. Regulated trapping is the most efficient and practical way to regularly maintain furbearer populations at no cost to the public. Regulated trapping will not eradicate diseases, but it may help control the transmission of disease (NEFRTC 2001).

Implementation of a regulated trapping program on the refuge also provides a mechanism to collect information, and possibly contribute to research on furbearer (and other wildlife) occurrence, activity, movement, population status, and ecology. The ecological and monitoring benefits are management services that will be accomplished through minimal or no cost to the government, compared to costs associated with using salaried staff or contractual arrangements with private individuals or organizations, other agencies, or refuge staff. By maintaining a trained and experienced cadre of trappers, the Service can utilize their skills and local knowledge to perform or assist with valuable management or research functions (Mason 1990). Trappers who participate in the refuge program would provide assistance with the implementation of structured management objectives, such as the alleviation or reduction of wildlife damage conflicts, negative interactions among species, and habitat modifications. Refuge trappers typically have a stake in proper habitat and wildlife conservation and protection of the ecological integrity of the refuge so they can continue trapping. Accordingly, they are valuable assets for the refuge manager in providing on-site reports concerning the

fundamental status of habitat, wildlife, and refuge conditions. In fact, trappers who currently participate in the furbearer management program have provided valuable wildlife population status updates and unusual sightings, including Canada lynx use of division habitats. Trappers reported seeing lynx snow tracks within the division before they were confirmed breeding in northeastern Vermont. Trappers have also reported road and property damage caused by storm water and beaver activity, allowing management to address the issue in a timely manner.

Furbearers are considered a renewable natural resource with cultural and economic values (Andelt et al. 1999, Boggess et al. 1990, NEFRTC 1996, Payne 1980). Several human dimensions studies have documented trapper profiles, cultural aspects of trapping, and the socioeconomic role of trapping in the United States (Andelt et al. 1999, Boggess et al. 1990, Daigle et al. 1998, Gentile 1987). A regulated trapping program on the division also fosters the appreciation of the division's wildlife and habitats and provides opportunities for wildlife observation, a greater understanding of ecological relationships, a sense of natural resource stewardship, and continuation of a wildlife-dependent use across generations. Trapping is an activity in which family members and friends often participate jointly and share experiences that broaden the sense of appreciation for natural resources and ecological awareness, and indeed even a sense of community (Glass et al. 1991, Daigle et al. 1998).

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The furbearer management program will be reviewed annually to assess its effectiveness and to ensure and that wildlife populations and habitat quality are managed appropriately. In addition to VFWD trapping regulations, the following SUP conditions will apply:

(1) Any person engaging in activities on the Nulhegan Basin Division of the Conte Refuge that would be defined as trapping under Vermont State law must be in possession of a valid Vermont trapping license and a valid refuge SUP and will present such credentials to refuge officials and Federal and State law enforcement agents upon their request. This permit is valid only for trapping conducted on the Refuge during the legal trapping seasons established by the State of Vermont and only for species legal for trapping harvest as defined by the State of Vermont.

(2) In consideration of being permitted to engage in the activity authorized under this permit at the Nulhegan Basin Division of the Conte Refuge, **Permittee**, being of lawful age, for himself and his personal representative, heirs, and next of kin, hereby releases, waives, and forever discharges the United States of America, its agents and employees, all for the purposes herein referred to as, Releasees, from any and every claim, demand, action or right of action, of whatsoever kind or nature, either in law or in equity, arising from or by reason of any bodily injury or personal injuries known or unknown, death and/or property damage resulting or to result from any injury, which may occur while engaged in the permitted activity, and covenants not to sue the Releasees, for any loss or damages, and any claim or damage therefor, on account of injury to the person or property or resulting in death of the Permittee, whether caused by the negligence of Releasees or otherwise.

(3) Permittee agrees to indemnify, defend, save and hold harmless the Releasees and each of them from any loss, liability, damage or cost Releasees may incur due to the presence of Permittee in or upon the said property of the United States. Releasor agrees that this release and waiver is intended to be as broad and inclusive as permitted by the laws of the State of Vermont and that if any portion thereof is held invalid, it is agreed that the balance shall notwithstanding, continue in full legal force and effect.

(4) Permittee will obey the laws of the United States and Vermont, including those concerning trapping, firearms, motor vehicles, and snowmobiles, while engaged in activities connected with this permit.

(5) Travel by motor vehicle is restricted to established roads, and travel by snowmobile is restricted to the designated Vermont Association of Snowmobile Trails trail system, unless otherwise specifically authorized by separate permit from the wildlife refuge manager.

(6) Use of all-terrain vehicles is prohibited.

(7) Permittee will use every feasible precaution against causing damage to refuge roads, lands, and waters. Permittee will report any damages as soon as possible.

(8) Permittee will not conduct activities in connection with this permit in any manner that would interfere with or cause hazards to vehicular or snowmobile travel, or the activities of refuge visitors.

(9) Permittee shall not litter, or start or use open fires on refuge lands.

(10) Permittee is required to submit a completed Refuge Trapper Report accompanying this permit to the Refuge Manager within 30 days of the close of the Vermont trapping season. Report forms MUST be submitted whether or not any trapping was conducted or any animals were captured. NOTE: Failure to submit this report will be grounds for denial of a refuge trapping permit for the following season.

(11) Captured lynx must be reported to the refuge office (802.962.5240) and State Game Warden (802.334.8881) as soon as possible and prior to removing the animal from the trap, unless these contacts are unable to be reached in time to prevent injury to the lynx. Any lynx released must be reported within 24 hours from the time it was discovered.

- Always be prepared to handle a lynx when trapping in lynx habitat.
- Be in possession of a catchpole and use it to release a lynx taken incidental to harvest of other furbearers or predators.
- Refrain from setting traps for bobcats where lynx tracks are observed or lynx are known to be present.

Furthermore, given the uncertainty regarding the continued presence and breeding status of lynx and the need to communicate lynx-related information with trappers, additional investigations will occur as part of the division's annual operations. Specifically, in collaboration with Service and VFWD personnel, scientific information regarding the status of lynx on the division will be collected by employing a combination of the following:

- Surveys to assess relative abundance of snowshoe hares, which may help managers to determine if adequate prey resources to support lynx reproduction are available.
- Snow track surveys to determine if lynx are present during late winter, which will indicate that Canada lynx have established home ranges on the division.
- Camera trap surveys to determine if lynx are present during periods of no snow cover.
- Telemetry studies of female lynx to identify denning sites and detect den relocation movements.

Lastly, although the trapping effort has been modest to date, with an average of three trappers each season, if future conditions warrant, the Service may regulate the numbers of target species taken in any one location as well as the number of trappers or number of traps per trapper allowed as necessary to address resource issues. If we determine that limits on the number of trappers are necessary, we would follow the procedures outlined in the Service's Refuge Manual (5 RM 17.11).

## JUSTIFICATION:

We have determined that allowing trapping on the division would not materially interfere with, or detract from the mission of the Refuge System or the purposes for which the refuge was established for the following reasons. First, furbearer populations are stable in Vermont, and since its inception, the furbearer management program has not had any known negative impacts on furbearer populations. Second, at its current and projected low level of use, as well the timing of the use, adverse impacts to wildlife and habitat are expected to be minimal because of the temporal separation of trapping activities (usually fall and winter) and breeding wildlife (usually in spring).

In fact, based on the analysis presented above, we have determined that this use would contribute to the mission of the Refuge System and the purposes for which the refuge was established. Furbearer management through trapping on the division is a useful tool in maintaining balance between furbearers and their habitat. High populations of predators can decrease the survival and nesting success of migratory birds, thus compromising one of the division's central purposes, and by managing coyote populations, may reduce interspecific competition for prey with Canada lynx. Trapping may provide monitoring information that otherwise would be expensive and difficult to obtain using refuge resources; and potentially may contribute to research on furbearer (and other wildlife) occurrence, activity, movement, population status, and ecology. By maintaining a trained, experienced group of trappers, the Service can use their skills and local knowledge to perform or assist in valuable management or research functions. Participating trappers could assist with the implementation of structured management objectives, such as the alleviation or reduction of wildlife damage conflicts, negative interactions among species, and habitat modifications; maintenance of the vigor and health of furbearer populations; and safeguarding the refuge infrastructure critical to habitat management for focal fish and wildlife species, as well as necessary for priority recreational activities. Trapping also helps build appreciation for natural resources, ecological awareness, and support for the Refuge System.

Our determination is based on existing, available information, including our own observations. Should we learn that there are adverse impacts we did not anticipate, either from monitoring the use or from other reliable sources, we will modify the use and the stipulations to avoid or minimize potential adverse impacts as swiftly as possible.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 10-YEAR RE-EVALUATION DATE: _____

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# COMPATIBILITY DETERMINATION

## USE:

Hunting on Silvio O. Conte Refuge Lands in Vermont

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species, and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE:

**(a) What is the use? Is the use a priority public use?**
The hunting of big game, small game, furbearers, and migratory birds on refuge lands in Vermont, including the existing Nulhegan Basin Division and Putney Mountain Unit. Both of these were officially opened to hunting during the 2013-14 season, when a Hunt Plan, Compatibility Determination, and Environmental Assessment were finalized. This compatibility determination updates information and analysis for these lands; Nulhegan Basin Division had previously been opened to hunting under a 1999 pre-acquisition compatibility determination.

Hunting was identified as one of six priority public uses by Executive Order 12996 (March 25, 1996), and legislatively mandated by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

**(b) Where would the use be conducted?**
Hunting will occur on the Nulhegan Basin Division (division) located in Ferdinand, Lewis, Brunswick, and Bloomfield, Essex County (Fig. 1), and the Putney Mountain Unit (unit) in Brookline and Putney, Windham County (Fig. 2). After completing the U.S. Fish and Wildlife Service's administrative procedures, additional lands acquired at the division from willing sellers will be open to hunting consistent with the regulations of the State of Vermont. It is the intent of the refuge to allow hunting at new refuge divisions when sufficient and suitable land, capable of supporting a quality and safe hunter experience, is acquired from willing sellers.

The division consists of 26,605 acres of high quality black spruce-tamarack, spruce-fir, and northern hardwood forests, free-flowing rivers, and bogs. The unit contains 285 acres of hardwood forest and scattered beaver wetlands. These habitats support small and large mammals all year round, and neotropical migratory birds during the nesting season and during spring and fall migrations.

**(c) When would the use be conducted?**
Refuge property will be open to hunting during the seasons and times set by the State of Vermont with the exceptions described below in "Stipulations Necessary to Ensure Compatibility." For most species, the daily hunting period will begin one-half hour before sunrise and end one-half hour after sunset. Migratory game bird hunting begins at one-half hour before sunrise and closes at sunset. A special use permit (SUP) is required for refuge use outside of regular refuge hours (one-half hour before sunrise and one-half hour after sunset).

**(d) How would the use be conducted?**
All refuge lands will be open to the hunting of big game (white-tailed deer, moose, black bear, and wild turkey), upland game (coyote, fox, raccoon, bobcat, woodchuck, red squirrel, eastern gray squirrel, porcupine, skunk, snowshoe hare, eastern cottontail, and ruffed grouse), and migratory birds (ducks, geese, crows, and American woodcock) as defined by the State of Vermont. Hunting will conform to State seasons and in accordance with State of Vermont, Federal, and refuge-specific regulations to include archery, firearms, muzzleloader, and dog training seasons.

Access will be in the form of motor vehicles operating on roads open to the public, snowmobiles operating on designated snowmobile trails, and pedestrian access (walking/hiking and snowshoeing). In addition, the use of draft horses to recover downed moose, a supporting activity, would be allowed by SUP.

Areas may be closed if there are unacceptable resource impacts such as soil erosion, repeated disturbance to susceptible wildlife, or irresolvable conflicts with other compatible priority public uses. The need for site closures will be considered by the refuge manager on a case-by-case basis.

The hunting program will be reviewed annually or as needed, in consultation with the Vermont Fish and Wildlife Department (VFWD) to assess its effectiveness and to insure that wildlife populations and habitat quality are managed appropriately. In addition, refuge-specific regulations listed below under "Stipulations Necessary to Ensure Compatibility" will apply.

**(e) Why is this use being proposed?**
Hunting is one of the priority uses outlined by Congress in the Refuge Improvement Act of 1997. The Service supports and encourages priority uses on national wildlife refuge lands where appropriate and compatible. Hunting is used in some instances to manage wildlife populations. Hunting is also a traditional form of wildlife-oriented recreation that can be accommodated on many National Wildlife Refuge System (Refuge System) lands. There also is a strong hunting heritage in Vermont and in the areas covered in this document.

As previously discussed, the Nulhegan Basin Division and Putney Mountain Unit have been open to hunting under Service ownership. Hunting would continue on these lands and newly established divisions in the state if sufficient land is acquired.

## AVAILABILITY OF RESOURCES:

There are sufficient funds within the refuge's annual operating budget to administer these hunts. All hunts will be administered in accordance with existing federal and State regulations. The refuge shares a federal wildlife officer with Umbagog National Wildlife Refuge, and this officer will conduct enforcement patrols on refuge properties in the State. Additional law enforcement staff, as described in the refuge's Comprehensive Conservation Plan (CCP), will eventually be necessary as new divisions are established.

Projected costs to fund the hunting program are estimated below.

| | **Annual Costs** |
|---|---|
| *Document Preparation and Review* | $600 |
| *Supplies/Brochures/Sign Maintenance* | $500 |
| *State Consultation* | $500 |
| *Processing SUPs/Monitoring Resource Impacts* | $600 |
| *SUP compliance* | $2,700 |
| *Law Enforcement/Responding to the Public* | $4,200 |
| **Total Annual Costs** | **$9,100** |

The estimated annual costs listed above are primarily salary costs and do not reflect efforts coordinated with VFWD (e.g., law enforcement). Monitoring public use and providing law enforcement are required to properly administer public use programs; therefore, these operations are accounted for in budget and staffing projections.

## ANTICIPATED IMPACTS OF THE USE:

Hunting can result in positive or negative impacts to the wildlife resource. A positive effect of allowing hunter access to the refuge will be a better appreciation and understanding of the wildlife and habitats associated with northern New England ecosystems. This can translate into more widespread and stronger support for the refuge, the Refuge System and the Service. The typical range of impacts are addressed in greater detail in the Environmental Assessment of Public Hunting on Refuge Lands in Vermont (U.S. Fish and Wildlife Service 2012).

### Effects on Air and Water Quality

Air quality and water quality impacts will be minimal and limited to automobile and snowmobile emissions on open roads and trails and subsequent surface runoff. These effects will not only come from hunters but also from other users engaged in wildlife-dependent recreation. The effects of hunting-related activities, as well as other management actions on overall air and water quality in the region will be negligible, compared to the effects from industrial centers and non-refuge vehicle traffic.

### Effects on Vegetation

The physical effects on vegetation from hunting are expected to be minimal because hunters tend to travel on existing roads and game trails. Some dispersed hiking/snowshoeing is anticipated, but it will generally be dispersed over large areas.

Positive effects on the vegetation may result by maintaining white-tailed deer and moose populations at levels in sync with the carrying capacity of available habitat. The impacts of dense deer populations on forest regeneration and the composition and diversity of the herbaceous understory have been well documented (Tierson et al. 1966; Behrend et al. 1970; Tilghman 1989). Opening the refuge to deer hunting will at least maintain the habitat as it is now, prevent degradation due to overbrowsing, and promote successful natural regeneration and a more sustainable plant community. Well-managed hunting can effectively control deer and produce dramatic changes in the forest vegetation (Behrend et al. 1970). The impact of deer hunting on the

vegetation will be positive and result in better regeneration of forest canopy species and an increase in the diversity of the herbaceous understory. With regard to moose, this positive change has been observed at the division concurrent with a recent decline in the moose population.

Possible negative cumulative impacts of recreational hunting include temporary trampling of vegetation and light soil erosion. Spring turkey season could cause some trampling effects to growing plants, especially in wet areas; however, we do not expect these impacts to be substantial, because turkey hunter density is expected to be low and dispersed. Most hunting occurs during the fall, but hunters tend to disperse when in the woods; as a result, we do not anticipate substantial impacts to habitats. Some hunt seasons extend into winter when the ground is either frozen, covered in snow, and/or when plants are dormant. Hunters would have little impact on plants during this period. For these reasons, cumulative impacts to plant communities and soils are not likely to be significant during either the fall or spring hunting seasons.

## Effects on Soils

It is anticipated that minor impacts to soils will occur as a result of allowing hunting access on the refuge. Soils can be compacted and erode as a result of repeated foot traffic, especially those soils associated with wetland habitats. Erosion potential will likely vary during the season based on soil moisture and temperatures. During much of the hunting season, soils may be frozen or covered in snow, thereby reducing the impacts greatly. At the anticipated use levels, and because hunters tend to disperse when searching for game, impacts to soils (erosion and compaction) are not likely to be significant.

## Effects on Hydrology

Hydrology impacts from hunting would be minimal and only result from the use of roads and trails. Unsurfaced trails are susceptible to a variety of impacts including vegetation loss and compositional changes, soil compaction, erosion, and muddiness, exposure of plant roots, trail widening, and the proliferation of visitor-created side trails (in Marion and Leung 2001). However, these effects are considered minimal due to the fact that hunters are generally dispersed, which reduces repeated erosive actions on soils. Also, hunters will not be permitted to use vehicles off designated refuge roads, although some dust, drift, or runoff may land in streams when hunters are travelling on designated roads near or crossing streams. In addition, soils are generally frozen during the latter portion of the hunting season thus reducing the potential for erosion and downstream sedimentation.

## Effects on Other Visitors

Conflicts between hunters and other refuge visitors can occur, particularly where there is concentrated use by both groups. The refuge has not experienced such conflicts in any measurable amount but recognizes this potential. Because hunting is generally a long-standing use-common on the surrounding landscape, and is dispersed across a large landscape, it is anticipated that there would be negligible impacts to those individuals participating in fishing, wildlife observation and photography, environmental education, and wildlife interpretation. The refuge will, if circumstances warrant, modify public access such that conflicts are avoided (e.g., restricted hunting zones, enhanced outreach).

## Effects on Wildlife-Game Species

Hunting is not expected to have adverse effects on game species because of the hunting regulations set by Federal and State agencies. Hunting is an important tool for wildlife managers to control populations of game species that might otherwise exceed habitat carrying capacity and threaten the well-being of other wildlife and, in some instances, that of human health and safety (USFWS 2010). The Service has ultimate responsibility for regulating migratory bird (e.g., ducks, geese, American woodcock) hunting Nationwide based on Federal law established by international treaties with Canada, Mexico, and other countries with whom we share migratory birds. The Service establishes the frameworks that govern all migratory bird hunting in the United States through a public process each year. Within the bounds of the frameworks, state wildlife agencies have the flexibility to determine season length, bag limits, and areas open to hunting.

Each state has primary authority over hunting of wildlife that reside within state boundaries (e.g., deer, moose, ruffed grouse, turkey) (USFWS 2010). In Vermont, the VFWD manages game based on geographically defined

Wildlife Management Units (WMU). This allows VFWD to manage game populations across a diverse State at acceptable levels.

The scale of management for both migratory birds and resident game is typically much larger than refuge-administered lands. The Atlantic Flyway, is the basis for managing migratory birds found in Vermont. This Flyway includes states along the Eastern Seaboard, Puerto Rico, U.S. Virgin Islands, and in Canada, Nunuvut, and the Maritime Provinces (USFWS 2008). For resident game, Vermont uses WMUs as the basis for population management. WMUs are at a scale that allows VFWD to efficiently and effectively manage game populations. As an example, WMU E1 contains the entire towns of Norton, Canaan, Lemington, Averill, Lewis, Warners Grant, Warren Gore, Avery's Gore, as well as, most of Bloomfield and portions of Brunswick, Ferdinand, Brighton, Morgan and Holland. In comparison, the Nulhegan Basin Division comprises about 26,605 acres in the towns of Lewis, Bloomfield, Brunswick, and Ferdinand. Hunting on refuge-administered lands is not at a scale that will affect populations of resident or migratory game species.

Hunting invariably results in the removal of individual animals from populations. However, the goal of wildlife managers is to maintain populations at levels that are within the habitat carrying capacity and socially acceptable, while providing a sustainable harvest for hunters. Hunting on refuge-administered property provides opportunities for a priority public use while contributing to the overall management of species, whether at the Flyway or State levels.

## Big Game

***White-tailed Deer:*** The regulated hunting of deer in accordance with State regulations would facilitate ecological balance between refuge lands and the surrounding lands. Regulated hunting would not compromise the persistence of the species on refuge and surrounding lands. Through regulated hunting, deer populations are maintained in accordance with the available habitat. High deer densities have been shown to negatively impact plant and animal communities. Therefore, a hunting program would facilitate ecological diversity through mitigating the effects of high deer densities. Furthermore, deer wintering areas are critical to the survival of the species in northern climates. Thus, managing deer populations with a regulated hunting program would temper browsing pressure on deer wintering areas and limit declines in deer populations as a result of excessive winter browsing pressure that is out of sync with the maintenance of sustainable and quality deer wintering habitat.

The VFWD Big Game Plan (Vermont Fish and Wildlife Department 2009) establishes deer density objectives for both the Northeast and Eastern Foothill regions of between 10 to 15 deer per square mile. These densities, if maintained through regulated hunting, will sustain the native vegetation and forest regeneration associated with the natural communities in those regions. Regulated deer hunting prescribed to achieve the above density objectives also maintains a deer herd in good physical condition that staves off malnutrition and disease.

The VFWD actively monitors deer herd size and physical condition through the collection of harvest numbers and biological parameters at check stations staffed by wildlife biologists during select hunting season periods. This data is critical in providing the biological data needed to properly manage a deer herd in balance with its carrying capacity.

Hunting will not detrimentally affect deer populations on the refuge, as attested by the long history of regulated hunting in the State. Conservation Focus Areas (CFAs) and existing divisions only comprise a portion of a WMU. Habitat vacated by harvested deer would likely be occupied by other deer within a relatively short time. Hunting on the refuge in accordance with State regulations would contribute to the State's population objectives in the applicable WMU, which are designed to keep deer populations within carrying capacities.

Hunting other game species (e.g., moose, black bear, small game) will have a transient effect on deer. When hunters move through occupied habitat, the deer can be expected to flush and move away from the disturbance. Because hunting pressure is not expected to be high (Mark Maghini, personal observations at Nulhegan Basin), disturbed deer have other areas available, either on or off the refuge, to move away from hunters. Encounters will cause physiological stress and use of energy to avoid hunters, the same as encounters with any other refuge visitor.

***Moose:*** Historically common in Vermont, moose have returned with reforestation of the State during the late 20th Century. It was estimated that only a few dozen moose occupied Essex County in the 1960s. As numbers increased, a permit hunting program was begun in 1993 in WMU E (Essex County). This has since been expanded to other WMUs where moose population goals provide for a sustainable harvest. By 1997, nearly 2,100 moose existed in Vermont, with nearly a quarter of the population in WMU E. By 2008 the moose population was estimated in excess of 1,500 in WMU E (VFWD 2009). During the 2011 hunting season, a total of 92 moose were harvested in WMU E during both the newly instated archery only season and the regular moose season (VFWD 2012). The goal for moose management in WMU E is roughly a population of 1,000 moose (1.75 per square mile) (VFWD 2009).

The highest moose densities in Vermont currently occur in WMU subunit E1, which is 247 square miles in size and includes the entire division. Nearly 1,600 moose were harvested in this sub-unit from the 1993 through 2011 moose hunting seasons. From 2004 through 2011, 111 of these moose were taken from the division alone. The average moose harvest during this period was 0.35 moose/square mile, and in two of these years the harvest density equaled or exceeded 0.5 moose/square mile.

The high moose densities and consequently high harvest rates for sub-unit E1, including the division, combined with the high proportion of undeveloped land open to public access, make this region the most desirable unit to hunt moose for many Vermont hunters. Hunter success rates averaged 71.4 percent in E1 from 2004 through 2011. Permit numbers for E1 reached a peak of 300 in 2008 and 2009 when VFWD was trying to reduce the moose density below biological carrying capacity. This goal was achieved and with the current density estimate of 1.75 moose/square mile, permits have been reduced to 70 for this sub-unit. Since the onset of modern moose seasons in Vermont in 1993, only one moose was harvested in the town of Putney.

Vermont's regular moose hunting season is open for one week beginning on the third Saturday in October. Beginning in 2012 and continuing for the foreseeable future, the moose harvest in subunit E1 is expected to stabilize at around 45 moose annually. In addition, Vermont instituted a special archery-only moose season in 2011, with 50 permits issued Statewide. This 7-day season begins October 1, and permit holders select their desired WMU. Many of the moose archery hunters have selected subunit E1 (27 in 2011 and 17 in 2012), and 7 and 5 E1 moose were taken by archers in 2011 and 2012, respectively. The majority of moose harvested by archers are bulls and consequently the archery take has negligible effect on population dynamics. For this reason, and because regular season permits are expected to remain stable, no measurable changes are anticipated in the moose population on the division in the near future due to hunting. Hunting of moose as stated in the proposed action should have no adverse cumulative effects on their local, regional, or global populations. Furthermore, the VFWD has proposed a realignment of the existing WMUs that will effectively eliminate the likelihood that moose hunting permits will be made available for WMU O, which includes the Putney Mountain Unit. An additional positive impact of moose hunting is to minimize negative effects of browsing on forest regeneration.

***Black Bear:*** The black bear is cherished by hunters as a valuable game species for both its meat and pelt. Since 1995, the black bear population has doubled to approximately 5,000 individuals and bears now occupy 80 percent of the State (VFWD 2009). Approximately 500 bears are harvested annually by licensed hunters in the State with substantial numbers of them being taken in the two management units that contain the Nulhegan Basin Division (WMU E) and Putney Mountain Unit (WMU O2). People hunt for many different reasons, but over 90 percent of hunters who were surveyed listed the reason they hunt for black bear was "for food." (Duda et al. 2007).

Black bears are the State's largest predator and have few natural enemies. The VFWD uses regulated hunting as a means of controlling population growth while monitoring the population to ensure that the legal harvest is sustainable. Vermont's black bear plan, 2010–2020 calls for a statewide bear population objective of between 4,500 and 6,000 bears (VFWD 2009). Hunting is a critical tool in maintaining this population objective. Management objectives also revolve around maintaining wild, free-ranging, viable populations of black bear as well as the conservation of large blocks of habitat. There are currently 25 laws and regulations that regulate the harvest, utilization, and sale of bears in Vermont. Black bear season is currently set on a Statewide basis with no regulatory differences among WMUs. The season length is one of the longest in the nation, extending from September 1 to the Wednesday following the opening day of the November deer rifle season. Use of trained hunting dogs to hunt bears is allowed via state issued permit. The bag limit is currently set at one bear

per licensed hunter per season. In a 2007 survey of Vermont hunters, 17 percent of all hunters had hunted black bears within the past 5 years (Duda 2007).

Although considered a valuable game species, black bears annually cause extensive agricultural and property damage and are capable of inflicting injuries to humans. Most human injuries have involved bears that had lost their fear of humans. Hunting is used not only as a tool for controlling the population but also as a means of keeping bears wary of humans. A liberal hunting season and the use of trained dogs for hunting are believed to enhance this behavior modification of bears. This reduces the number of bears that might become "nuisance animals," causing damage to livestock or farmers' crops, raiding dumpsters, or entering buildings in search of food. Hunting plays an important role in shaping Vermont's cultural carrying capacity for bears.

***Wild Turkey:*** In the late 1960s the VFWD reintroduced wild turkeys to the State. Only 40 years after the reintroduction, turkeys now range throughout the entire State and have successfully exploited Vermont's mosaic of forestland and dairy farms. Wild turkeys have thrived in Vermont and public participation in turkey hunting has continued to increase. During the past 7 years, 5,200 to 6,900 birds have been harvested annually in a sustainable manner by 15,500 to 17,800 hunters. Turkeys have become a valuable game species in the State and roughly 400 are harvested annually in the WMUs encompassing refuge lands.

The overall goal of wild turkey management in Vermont is to manage the State's wild turkeys to sustain healthy, abundant populations that will provide hunting and viewing opportunities that will satisfy social expectations and tolerances for turkeys. This management goal aims to sustain an abundant wild turkey population that is truly wild and that is below both the biological carrying capacity of its habitat and the cultural carrying capacity desired by the public. Populations of turkeys that exceed the biological carrying capacity of their habitat can be decimated by diseases (including Avian Pox that can spread to other bird species) and are capable of degrading their habitat. Populations that are allowed to exceed the cultural carrying capacity can cause extensive agricultural damage. U.S. Department of Agriculture Wildlife Services reports that many farms within the Connecticut River valley already sustain damage from wild turkeys to their stored silage and corn crops. Regulated hunting plays an important role in limiting agricultural damage from turkeys.

## Small Game Species

The small game species most pursued on the division include ruffed grouse and snowshoe hare. Limited habitat for eastern cottontail rabbits and gray squirrels restrict hunting interest and hunting pressure on these species and refuge lands. The unit's habitat provides for small game populations of ruffed grouse, gray squirrel, and eastern cottontail rabbits.

All of the small game species present on the refuge are r-strategist species, demonstrating high productivity and mortality rates, with population densities often tied to the quality of available habitat. Most of the small game species' populations are positively influenced by increasing percentages of younger forest age classes that provide the mix of cover and foods for these animals. In particular, Essex County within which the division lands occur has 24 percent of its forestland in small diameter and 20 percent in medium diameter size classes (U.S. Department of Agriculture 2011). Consequently, this area has more early successional forestland than any other region of Vermont. This provides a significant high quality habitat foundation to support higher densities of these species. Even so, population fluctuations can be driven by weather, changes in predator populations, and annual fluctuations in food supplies.

***Ruffed grouse:*** Ruffed grouse are the most pursued small game species in Vermont. The 2007 hunter survey estimated ruffed grouse were the fourth most popular game species in Vermont with 16 percent of hunters pursuing them within the last 5 years (Duda 2007). While Vermont's ruffed grouse season runs Statewide from the last Saturday in September to December 31, ruffed grouse hunters hunted this species only a median of 6 days per season. Participation trends showed October is the most popular month for grouse hunting with greatly reduced participation in December. Vermont's ruffed grouse hunting activity is not considered high enough to negatively influence the natural fluctuations that this species experiences from the other population limiting factors described above (S. Darling pers. comm.).

***Snowshoe hare and Eastern Cottontail:*** Vermont's rabbit season, which includes both snowshoe hare and eastern cottontail rabbits, runs Statewide from the last Saturday in September through the second Sunday

in March. An extension of the season to March 31 was instituted in WMUs D1, D2, and E in 2012. The season extension was granted for this and neighboring WMUs because of the superior snowshoe hare habitat conditions in those regions. In particular, the quantity of young forest is especially large in these WMUs (USDA 2011). This represents excellent habitat conditions that should nearly optimize cover and food conditions for snowshoe hare. For this reason, the extended season length would not negatively influence hare densities. This season extension does not apply to the Putney Mountain Unit. Approximately 12 percent of Vermont hunters have pursued rabbits according to the most recent hunter survey (Duda 2007).

***Gray squirrel:*** Gray squirrel populations are considered cyclic in nature, fluctuating widely with mast production and periodic spikes in population that result in significant emigrations. Hunting mortality is compensatory and generally not considered a factor in controlling squirrel populations (Edwards et al. 2003). The Vermont gray squirrel season occurs Statewide from September 1 through December 31. Duda (2007) indicated that approximately only 7 percent of Vermont hunters had pursued gray squirrels within the preceding 5 years. This low participation rate, coupled with the cyclical nature of squirrel populations indicates that hunting levels on the refuge are too low to negatively impact populations. Gray squirrel populations are present on the Putney Mountain Unit and the more mature forestland of red oaks and beech offer suitable fall food supplies that can provide for higher, more sustainable densities of gray squirrels.

## Migratory Birds

Migratory birds are managed on a flyway basis and hunting regulations are established in each state based on flyway data. Atlantic Flyway and State of Vermont regulations would apply. The total numbers of birds in the flyway is reduced as a result of hunting on refuge lands, but would certainly be within allowable limits as determined by State and Federal agencies. Disturbance to non-target birds and resident wildlife would likely occur from hunting and associated hunter activity, but would be short-term and temporary. Waterfowl hunter activity is light (estimated at fewer than 20 visits per year) due to a lack of accessible waterfowl habitat and therefore has little impact on nontarget species, habitats, or other refuge visitors. Effects of woodcock hunting are similar to those of ruffed grouse (above).

## Furbearing Species

The hunting of furbearers in Vermont is a long standing tradition. Furbearer hunting in Vermont is highly regulated and is restricted to raccoon, coyote, fox, muskrat and bobcat. Populations of these species are monitored annually via the close examination of certain indices such as harvest numbers, sex/age ratios, catch per unit effort and pelt sales (VFWD 2012). Although much of this information is gathered from trapping records, all data indicate healthy and sustainable populations of these species under current harvest regimes, including hunting. Furthermore, the analysis of annual harvest records allows furbearer resource managers to not only foresee potential issues for these species and to react accordingly, but also to revise harvest regulations as necessary in order to ensure viable populations into the future.

Because the furbearer hunting seasons are largely set at a time of year when pelts are prime and of highest value, the harvest of furbearers during the regulated hunting seasons provides citizens an opportunity to utilize these sustainable, renewable fur resources. Several of these furbearing species are commonly viewed as nuisance animals as a result of their feeding behavior, which can conflict with the interests of humans. State statute allows landowners to resolve nuisance furbearer issues on their property, including by lethal means. This annually results in the taking of furbearers by unregulated and unmonitored means and contributes to the waste of an otherwise valuable fur resource because these animals are commonly taken out of season when their pelts are of limited value. Although nuisance furbearer activity is limited on refuge lands, the regulated hunting of furbearers on the refuge may contribute to the reduction of nuisance wildlife activity occurring on adjacent lands and, therefore, help to minimize the waste of this sustainable resource.

***Coyote:*** The coyote is distributed Statewide and is considered abundant (VFWD 2012). The coyote population will likely remain relatively constant unless a higher-order predator becomes reestablished.

Some members of the public have a desire to control or eliminate coyote populations, based on their presumption that coyotes are limiting deer populations. However, hunting and trapping has little to no effect in determining Statewide coyote population levels. A Maine study found that there would need to be mortality rates greater than 70 percent in order to reduce the coyote population (Jakubas 1999).

During the past 20 years, the annual coyote harvest has ranged between 600 and 800 animals, although effort has varied widely. No measurable changes are anticipated in the coyote population on the refuge lands in the near future due to hunting. Hunting of coyotes as stated in the proposed action should have no adverse cumulative effects on their local, regional or global populations.

Distemper, sarcoptic mange, and rabies are common diseases sometimes found in coyote populations at higher densities. Maintaining the currently stable coyote population with hunting can aid in stemming the spread of disease. Additional potential positive impacts of hunting coyotes would be a localized, temporary reduction in coyote numbers, which may alleviate the effects of nest depredation by coyotes on resident and migratory birds, as well as predation on white-tailed deer and potentially neighboring livestock.

***Red Fox:*** Red fox populations are distributed Statewide and considered to be abundant and stable (VFWD 2012). Historical records indicate that their population has had continuous growth since the early 1800s as agriculture and logging began to create red fox habitat.

Red fox are hunted, but most take of this species in Vermont is from trapping. Harvests across the State of Vermont have increased over the previous decade. No measurable changes are anticipated in the red fox population on refuge lands in the near future due to hunting. Hunting of red fox as stated in the proposed action should have no adverse cumulative effects on their local, regional or global populations.

Distemper, sarcoptic mange, and rabies are common diseases sometimes found in red fox. Hunting of red fox may aid in stemming the spread of disease (Sterner and Smith 2006). The ability to control and/or maintain their population through hunting can reduce the risk of diseases spreading to other species. Additional potential positive impacts of hunting red fox would be a temporary, localized reduction in fox numbers, which may alleviate the effects of nest depredation by foxes on resident and migratory birds.

***Raccoon:*** Given the division's boreal climate, raccoon are rare and any hunting take is low and perhaps unlikely. Raccoon are more common in southern Vermont, and hence more likely to be pursued at the Putney Mountain Unit. Following State regulations based on data indicating at least stable populations, the Service concludes that it is highly unlikely that the harvest of this species will have any direct significant impact to local or regional populations.

The raccoon population is stable and healthy, and any harvest on refuge lands has been and is expected to remain small, and therefore have no effect on the Statewide population (VFWD 2012).

***Bobcat:*** The bobcat is a trapped and hunted species that is distributed Statewide. Hunting accounts for roughly one-third of the annual harvest. The overall harvest has increased during the past decade, from approximately 74 per year during the first half of the decade to 89 annually in the second 5 years.

No measurable changes are anticipated in the bobcat population on refuge lands in the near future due to hunting. Hunting of bobcats as stated in the proposed action should have no adverse cumulative effects on their local, regional, or global populations.

## Miscellaneous Game Species

***Porcupine, Skunk, and Woodchuck:*** Hunting for porcupine, skunk, and woodchuck in Vermont is most often incidental to hunting other species. Some wildlife species compensate for decreased number (harvest) by increasing reproductive output. Davis et al. (1964), found that removal of large numbers of woodchucks from a population resulted in a decrease of other mortality factors on the population, increased birth rate, and increases in immigration. Thus, the population size remained stable even though three times as many woodchucks were removed from the treatment as from the control area. The populations of striped skunk, porcupine, and woodchuck are stable and healthy, and the harvest on refuge lands is expected to be very small, and primarily an incidental harvest while hunting other species (VFWD 2012).

## Endangered, Threatened, and other Non-game species

Anticipated direct, indirect, and cumulative impacts to the refuge's endangered species, threatened species, and non-game species are described below. The Service's New England Field Office will review this action

as part of an intra-Service Section 7 consultation under the ESA (16 U.S.C. 1536). Concurrence with a determination of "may affect, not likely to adversely affect" is anticipated.

### *Canada lynx*

Canada lynx are the sole federally listed species to occur on the division. The historic record of Canada lynx occurrence in Vermont is scant; there are only five records of lynx from the period 1797 to 1968, and there is no historical evidence of a breeding population (Kart et al. 2005). Recent lynx occurrence in Vermont has been documented since 2006, and breeding was first documented in 2009. To date, evidence of lynx reproduction in Vermont (corroborated via the genetic testing of biological matter collected during winter track surveys) has been documented in 2009, 2011, and 2012; all instances at the division (R. Cliche, USFWS, pers. comm.). Based on these sightings and other survey work conducted within the State, the division is thought to support Vermont's only known population of breeding lynx.

Lynx require boreal forest landscapes supporting a mosaic of differing successional forest stages that contain snowshoe hares and their preferred habitat conditions. Such conditions include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface; winter conditions that provide and maintain deep fluffy snow for extended periods of time; sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range (Federal Register 2013).

Canada lynx populations are dependent on landscapes containing relatively high snowshoe hare populations. However, snowshoe hare populations are prone to cyclic changes in abundance with years of high snowshoe hare abundance being followed by population crashes that result in years when they are relatively scarce. During these times of low snowshoe hare abundance, Canada lynx may cease reproducing or even abandon areas (Federal Register 2013).

As demonstrated by recent breeding records in northern Vermont, the physical and biological features essential to lynx are present in sufficient quantity and spatial arrangement to support several lynx home ranges, at least temporarily. However, because Vermont is located at the species' southern range limit, it remains uncertain whether the area contains the features in adequate quantity and spatial arrangement to support a persistent population. Based on their recent arrival and lack of historic information, we expect the lynx population at the division to be ephemeral.

The greatest concerns involve the hunting of bobcat with hounds and the presence of bear hounds, bobcat hounds, and beagles during the annual training season that begins June 1; lesser concerns involve potential pursuit by bear hounds beginning with the September 1 general bear hunting season. Hunting bobcat with hounds is of concern because it is assumed that dogs cannot discriminate between bobcat and lynx scent. The concern is alleviated somewhat by the likely presence of snow and the ability of hunters to discern between the species' tracks during the January-February bobcat season and recall their dogs. However, the potential exists for take to occur if the dogs mistakenly pursue a lynx. In order to address this concern, potential impacts will be addressed by maintaining a contact list of those participating in dog training and hunting with bobcat and bear pursuit hounds on the refuge–providing us a means to share outreach materials and pertinent new information and alerts relating to lynx and their habitat as they arise. The refuge will continue to advise hunters of the presence of lynx and will work with VFWD in providing outreach materials and special considerations to follow while hunting in lynx habitat. The VFWD already provides a bobcat/Canada lynx comparison guide in their annual hunting digest.

The hunting of coyote with pursuit hounds is of lesser concern–very few coyote hunters employ hounds and for those who do, winter is the preferred season when deep snow conditions provide an advantage to the hounds (C. Bernier, VFWD, pers. comm.). As with bobcat hunting, the ability to discern tracks in snow enables the hunters to release their dogs on the target species, to monitor the pursuit, and to recall their dogs if they give chase to a non-target animal. Because lynx breed in March and April, it is conceivable that a breeding pair could be disturbed by a coyote pursuit hound. However, lynx possess a distinct advantage in traversing snow and are therefore not expected to suffer any noticeable harm. As with the use of other pursuit hounds, we will maintain

a contact list of those hunting coyotes with hounds in order to share information that can help minimize potential conflicts with lynx.

Hunting with beagles is of little concern as a direct impact to lynx; by the time of the late-September snowshoe hare hunting season, Canada lynx kittens are expected to be mobile and capable of evading beagles. In addition, beagles are generally not trained to remain with treed game (animals that seek refuge from pursuit by fleeing up a tree) and are expected to leave any Canada lynx soon after they seek refuge in a tree. We expect these events to be rare and of short duration, and not result in harm or harassment to an extent that take is anticipated. While the hunting of hares targets a primary prey item of lynx, the abundance of snowshoe hare habitat on the division and the fact that hare hunting has occurred at what appear to be stable levels of effort preceding and following the first observations of lynx, it is believed that hare populations are adequate to support breeding lynx and kittens.

With regard to the dog training season beginning June 1, no data exist that assess impacts of hounds on lynx, however lynx biology, behavior, and observations regarding the training of bear hounds, bobcat hounds, and beagles suggest that there may be some conflicts. The life history of lynx presents a number of factors that indicate the use of hounds during spring and early summer may expose lynx to incidental take. Lynx in the southern portion of their range breed in March and April with parturition occurring in late May to early June. Their altricial kittens are typically born in dens comprised of tip-up mounds created by blown down trees within areas of dense vegetation. Kittens remain in the den until they are approximately 5 weeks of age. While kittens are in the den, the female lynx typically restricts her travels so as to remain in close proximity to the den while making periodic visits to feed and care for the young. Kittens typically remain with the mother through the first 9 months, departing when the next breeding season approaches. During this time, kittens are dependent on their mothers while they develop their own hunting skills. Again, the potential for incidental take would be addressed by maintaining a contact list of individuals engaged in dog training on the refuge, thereby allowing for the sharing of species identification traits, life history information, and a means for rapid communication of key information, such as the discovery of a den site. Additional conservation measures to avoid take of lynx would be derived by studying lynx usage patterns. Our discussion on impacts to lynx is based on existing information. As we further monitor lynx activities on the division, and better understand hound usage levels and potential impacts, the administration of dog training will be subject to further refinement.

### *Northeastern bulrush*

The federally endangered northeastern bulrush is the only federally listed or proposed species known to occur on the unit. It is a wetland-dependent plant. Recent surveys have failed to document its presence; no above-ground growth was observed possibly due to persistent dry conditions (B. Popp, VFWD, pers. comm.). Little is known about the habitat requirements for this species, but it appears to have adapted to fluctuating water levels (USFWS 2006). In addition, populations have been known to return to an area once hydrological conditions improve (B. Popp, VFWD, pers. comm.). It is not expected that hunting would have any greater effect on this species than that of people walking across the unit for other purposes; trampling is perhaps a potential effect, but given its wetland habitat, such instances would be extremely rare. Hunting as proposed was found to not effect Northeastern bulrush in the intra-Service Section 7 consultation on the 2012 hunt opening package.

### *Spruce Grouse*

Spruce grouse is the only State-listed endangered bird species found on the division. In fact, Vermont's only viable breeding population of spruce grouse is mainly located on the division. In this region, their preferred habitat is multi-structured lowland areas dominated by spruce, balsam fir, and tamarack. Their diet is dependent on the availability of needles from these preferred tree species; especially in the fall and winter when other food sources, such as blueberries and insects, are not available (Alexander et al. 1993).

Some overlap exists between ruffed grouse and spruce grouse range on the division. The potential for a ruffed grouse hunter to mistakenly shoot a spruce grouse exists and could potentially interfere with recovery efforts. However, outreach in the form of true-color, informative signs depicting the difference between the two species placed in key locations on the division as well as a column in the annual VFWD hunting digest and frequent news releases appears to be mitigating the potential for inadvertent loss. Based on spring breeding surveys conducted by VFWD, spruce grouse numbers in the Nulhegan Basin (including the adjacent Wenlock WMA)

appear to be governed more by habitat quality and distribution than by incidental hunting mortality (J. Buck, pers. comm.).

### *Little Brown Bat*

The little brown bat was State-listed as endangered in 2011 as a result of the devastating disease white-nose syndrome. Statewide populations have declined an estimated 90 percent or more as a result of the disease. The little brown bat hibernates in caves and mines and the females migrate to summer maternity colonies located in buildings and, less often, dead or dying trees. Summer mist-net surveys conducted in nearby Charleston (Nulhegan Basin Division) and Townsend (Putney Mountain Unit) captured this species.

### *Northern Long-eared Bat*

The northern long-eared is listed as federally threatened and State-endangered due to similar white-nose syndrome-related population declines. This is a forest-associated bat that roosts in dead and dying trees. Summer mist-net surveys conducted in nearby Charleston (Nulhegan Basin Division) and Townsend (Putney Mountain Unit) captured this species. We anticipate that hunting will have no effect on northern long-eared bats, but we will continue to consult with Service endangered species staff with the New England Field Office to ensure there are no negative impacts to this species.

### *Small-footed bat*

The small-footed bat is listed as State-threatened due to its low abundance throughout the State. The bat hibernates in caves and mines during the winter, but is documented to roost in cliffs and ledges during the summer maternity colony season. Recent mist-net surveys in Townsend (near Putney Mountain Unit) documented the species in the vicinity of the unit.

Consultation with VFWD, as the relevant regulatory agency, has determined that the three State-listed bat species and spruce grouse will not be negatively impacted by a public hunting program (S. Darling, pers. comm.).

With regard to other non-game species, the maintenance of herbivore populations at sustainable densities will promote a forest vegetative community with successful regeneration and a robust understory, thereby fostering a balanced faunal community. The overall species diversity of the refuge is not expected to be diminished by this hunting alternative.

Disturbance to non-hunted migratory birds would likely be minimal at the regional, local, and flyway scale. Regional and flyway effects will not be applicable to species that do not migrate such as most woodpeckers, and some songbirds such as cardinals, titmice, wrens, chickadees, etc. Disturbance by hunting to non-hunted migratory birds is not expected to have detectable cumulative negative impacts because most hunting seasons do not coincide with the nesting season. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities, such as feeding and resting, of birds may occur. Disturbance to birds by hunters is probably commensurate with that caused by non-consumptive users.

The remaining concern is related to disturbance of ground nesting songbirds during the dog training season beginning June 1, in addition to grouse species and woodcock. Unless the dogs are directly destroying nests or causing mortality of adults, which is unlikely, the birds would probably acclimate to this level of disturbance without abandoning nests or having other major impacts. Therefore, this type of activity probably impacts some birds, but an insignificant and perhaps immeasurable number. It is anticipated that dog training would result in short-term and sporadic wildlife responses such as temporary flushing of ground nesting birds, perching birds, and mammals (R. Dettmers, USFWS, pers. comm.). Additional affects may include the minor trampling of vegetation, introduction of pathogens in feces (Sime 1999), and occasionally direct harm to wildlife by a young, inexperienced dog.

Cumulatively, hunter disturbance to non-hunted resident wildlife may be slightly negative; however, such an impact is unlikely because of the timing of the hunt. The hunts will occur during a time of the year when small mammals, reptiles, amphibians, and invertebrates are inactive and thus the likelihood of hunter interaction is

rare. Any isolated encounters with small mammals, reptiles, amphibians, and invertebrates should not have cumulative negative effects on populations.

### *User Conflict*

Given the well-established tradition of hunting on these refuge lands, conflicts with other recreational users are not anticipated due to the season of the year, traditional uses of the lands and general culture of the area, and precautions outlined in the existing Refuge Public Hunt Plan (USFWS 2013). All recreational users have equal access to refuge lands and the various user groups have historically coexisted. Furthermore, hunting is the predominant public use during the fall and hunters are highly dispersed across the refuge landscape. In an effort to limit potential interactions with the non-hunting public, additional precautions involving general ingress and egress via gravel roads were outlined in the following "Stipulations Necessary to Ensure Compatibility" section.

The overall impacts of this use were fully reviewed and discussed in the "Environmental Assessment, Public Hunting on Silvio O. Conte Refuge lands in Vermont" (USFWS 2012). Please refer to this document for a full discussion of direct, indirect and cumulative impacts for this use.

## Effects of Dogs/Dog Training

There is an increasing amount of research on the effects of domestic and feral dogs on wildlife (Miller et al. 2001, Young et al. 2011). Nature based human recreation is becoming increasingly popular in North America (Lenth et al. 2008) and can have a wide range of effects on wildlife, from altering the physical environment, to the response of the species themselves (Steidl and Powell 2006). The response of a species to a disturbance caused by recreation can range from short-term behavioral responses to long-term demographic responses. How much an activity affects wildlife will vary with length, regularity, amount, position, and timing of the activity as well as the species itself (Steidl and Powell 2006, Stevens et al. 2011). Within each species, changes in response may result from differences in individual characteristics such as: age, sex, size, physical condition, reproductive status, and habitat characteristics such as: season, abundance of alternative habitat, and an area's disturbance history (Stevens et al. 2011).

Domestic dogs often accompany outdoor recreationalists, both on a leash and off, and can have a variety of effects on wildlife. While some of the following species are not found on the refuge, the behavioral effects of dogs on endemic wildlife can be expected to be similar. The effects include increased heart rate and flushing distance of bighorn sheep (MacArthur et al. 1982), increased flush distance of golden plovers (Yalden and Yalden 1990) and marmots (Mainini et al. 1993), increased alert and flush distance of mule deer (Miller et al. 2001), and decreased mule deer, squirrel, rabbit, chipmunk, mouse, and bobcat activity near trails (Lenth et al. 2011) when compared to a pedestrian traveling without a dog. However, some species such as red foxes, woodlarks, and robins do not increase their activity or flushing distance in response to dogs (Miller et al. 2001, Mallord et al. 2007, Lenth et al. 2011). Miller et al. (2001) hypothesized that the difference in response of birds and mammals is an outcome of the differences in the perception of potential predators such that birds may have a reduced response to dogs alone because they are not traditional predators whereas domestic dogs resemble coyotes and foxes, which are natural predators of mammals. In addition, Lenth et al. (2011) suggested that wildlife may adjust their temporal activity patterns to co-exist with high levels of human recreation and dogs.

However, the previously mentioned studies, which constitute the preponderance of dog-wildlife impact research, only address the influence of dogs on designated trails such as those found in urban and suburban parks where dogs are confined to a delineated travel corridor. Training of hunting dogs on the division occurs in a densely forested landscape with few designated hiking trails. Therefore, it is highly unlikely that hunting dogs would travel the same ground twice and the inferences made from the previously mentioned studies to the effects of hunting dogs on wildlife may have only limited relevance. The limited studies available regarding the effects of hunting hounds on non-target wildlife found that white-tailed deer and wild turkey may be displaced from their home ranges only to return the next day or sooner (Sweeney et al. 1971, Lowry and McArthur 1978, Reed and Guynn Jr. 1990). In addition, studies investigating the effects of bear hounds on bears found that adult bears were displaced from their home ranges and returned the next day unharmed, and that cubs climbed trees to escape dogs and were unharmed (Allen 1984, Massopust and Anderson 1984, Elowe 1990).

## Effects of bear hounds

The training of bear hounds is currently known to occur only at the Nulhegan Basin Division. Based on average home range sizes that can range from 16 to 68 square miles for females and males, respectively (Alt et al. 1980), the division can support several adult black bears and cubs. As reported by houndsmen, it is also likely that bear density on the division is greatest during spring and early summer given that bears tend to favor agricultural lands in the Connecticut River valley later in summer and into fall.

In the typical course of an outing, a houndsman will slowly drive the division's roads with several dogs riding in the rear of a pickup truck, attempting to pick up the scent of a bear. When the dogs pick up the scent, they are released to begin the pursuit and the houndsman follows their progress by sound (barking) and by use of a tracking collar. The hunt can cover many miles and last hours, with the bears potentially traveling off the division or bears running onto the division from surrounding private lands. The pursuit ends when the bear is treed, the hounds lose the scent, or the hounds tire of the chase.

We do not have estimates for the number of handlers using the division, but can assume that at most two or three handlers may be on the division at one time. This would equate to 12 to 18 dogs within a division encompassing more than 26,000 acres. As a result, bear hound training is likely well dispersed over the division with negligible concentrated use, which would result in very low levels of vegetation disturbance and only incidental disturbance to wildlife. Likewise, the active hunting of bears with pursuit hounds beginning with the September 1 annual season is also widely dispersed. Although the extent of such hunting has not been quantified, handlers have described a generally low level of effort on the division given the relatively greater use of agricultural areas by bears during the fall hunting season. The effects of hunting with bear hounds is expected to be no different than those anticipated during the training season with the exception of a greatly reduced source of disturbance to migratory birds given that most such birds would have departed.

## Effects of bobcat pursuit hounds

The Nulhegan Basin Division represents the most likely current refuge land base where the training of bobcat pursuit hounds could occur. Bobcats occur on the division, but no assessment has been undertaken to determine their abundance, habitat quality, or prey availability. Statewide, the 10-year average annual harvest is 27 bobcats via hunting, which accounts for roughly one-third of the total annual harvest (VFWD 2012). Based on staff observations, it is not believed that the training of bobcat pursuit hounds is a common occurrence, although the activity would follow many of the same mechanics described for bear hounds above. Given the presumed low intensity of the activity, as well as, its dispersion across a large land base, it is believed that such activity would result in very low levels of vegetation disturbance and only incidental disturbance to wildlife.

Hunting bobcat with pursuit hounds could result in conflicts with Canada lynx given the presumed inability of a hound to distinguish between the two species based on scent. Potential impacts and suggested avoidance and conservation measures intended to avoid take of lynx are presented above in the section involving effects to lynx.

## Effects of coyote pursuit hounds

Although this use has not been documented by staff and is certainly not a common use, the potential exists at the division given its setting. While the division possesses characteristics that would support its desirability for hunting coyotes with pursuit hounds: relatively high coyote population, land open to hunting, and an extensive and lightly trafficked land base (C. Bernier, VFWD, pers. comm.), accessibility after December 15 is limited to snowmobiles (provided adequate snow cover exists), which may prove infeasible for transporting and managing multiple hounds. It is presumed that coyote hunters using hounds are dependent on identifying fresh sign and therefore are most likely to choose a season with snow on the ground (Willette 2011). The hounds pursue the coyote until it tires and they are able to surround it, allowing the hunter to approach for a shot. Aside from an incidental chase, effects to non-target individuals are expected to be minimal because the hunter can monitor the pursuit and recall the hounds if they strike on a species other than coyote. Given the presumed infrequency of the activity, as well as, its dispersion across a large land base, it is believed that such activity would result in only incidental disturbance to wildlife and very low levels of vegetation disturbance.

## Effects of beagles (snowshoe hare)

Snowshoe hare prefer young stands of spruce-fir forest for foraging and predator escape, and therefore beagle training would be concentrated in relatively few areas on the division. Unlike bear hound training, beagle training is confined to the dense spruce-fir areas because hare do not range as widely as black bear and stay within the dense vegetation for its forage and predator escape cover. The June 1 start of the training season coincides with the early portion of the songbird nesting season, which is one of the division's principal biological values. However, canids are not a common predator of the majority of songbirds which perch and nest in the branches of trees high off the ground. Therefore, the presence of dogs in the area is not likely to adversely affect the behavior of these songbird species. However, the regular activity of beagles within fairly discrete areas may cause a flushing response in ground-nesting songbirds, as well as, spruce grouse, a State-listed species whose habitat overlaps with snowshoe hare. The effects of this flushing response may be minimized given that it is a natural defense behavior against predators such as coyote, red fox, fisher, bobcat, and weasel. Consequently, flushing from hunting dogs may not be considered an unnatural behavior for spruce grouse and other ground-nesting birds, and therefore of lesser concern. Although greater than with bear hounds because of its concentrated occurrence, the potential for vegetation disturbance is not anticipated to be significant.

As with hunting with other pursuit hound breeds, the effects of hunting with beagles is expected to be no different than those anticipated during the training season with the exception of a greatly reduced source of disturbance to migratory birds given that most such birds would have departed by the late September hare season.

## Effects of bird dogs

The June 1 start of the training season coincides with the early to mid-point of nesting season for ground nesting songbirds and game birds such as woodcock and ruffed grouse. By this time, many chicks would have hatched and some would have fledged. Therefore, the presence of dogs and the training routine, which would otherwise most likely cause birds to flush from their nests or otherwise disturb them, is of modest concern. Also, while damage to nests has not been documented, the potential for any such effects by bird dogs is negated. Ground nesting birds have a variety of potential natural predators including coyotes, red foxes, fisher, and weasels and flushing/temporary displacement is a natural response of birds to avoid predators. Based on observations by staff, this type of training is infrequent; likely fewer than four outings per month. Therefore, any flushing caused by hunting dogs is a rare occurrence and may be viewed as a natural response, not one caused specifically by dog training. Just as with other forms of dog training, there is some potential for vegetation disturbance; however, any such impact is expected to be immeasurable.

The hunting of grouse and woodcock with dogs is a popular activity, particularly at the division. Incidental flushing of resident bird species is expected, although the effects are anticipated to be minimal given that this is a natural defense behavior to mammalian predators. The potential for vegetation disturbance is not anticipated to be significant.

## Summary of wildlife effects

Potential impacts to Canada lynx are the greatest wildlife-related concern; this is heightened with the training of wide-ranging pursuit hounds during the lynx denning period. Such potential impacts will be addressed by maintaining a contact list of those participating in dog training and hunting with bobcat and bear pursuit hounds on the refuge–providing a means to increase awareness of lynx and their habitats and a way of contacting users should new information arise. Additional avoidance and conservation measures intended to avoid take would be derived by studying lynx usage patterns. Our discussion on impacts to lynx is based on existing information. As we further monitor lynx activities on the refuge, and better understand hound usage levels and impacts, the administration of dog training will be subject to further refinement.

The remaining concern is related to disturbance of ground nesting songbirds, in addition to grouse species and woodcock. Unless the dogs are directly destroying nests or causing mortality of adults, which is unlikely, the birds would probably acclimate to this level of disturbance without abandoning nests or having other major impacts. Therefore, this type of activity probably impacts some birds, but an insignificant and perhaps immeasurable number. It is anticipated that allowing dog training would result in short-term and sporadic wildlife responses such as temporary flushing of ground nesting birds, perching birds, and mammals but that these would not have a negative impact overall on resident wildlife or migratory birds or the habitats they occupy. (R. Dettmers, USFWS, pers. comm.). Additional affects may include the minor trampling of

vegetation, introduction of pathogens in feces (Sime 1999), and occasionally direct harm to wildlife by a young, inexperienced dog.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.Determination (check one below):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The hunt program would be managed in accordance with Federal and State regulations. The hunting program would be reviewed annually to ensure management goals are achieved to ensure the program is providing a safe and high-quality hunting experience for participants.

During the hunting season, we will provide a law enforcement presence to ensure safety and compliance and post a notice at public entrances and trailheads reminding users that the hunting season is open and recommend wearing "hunter" orange.

In addition to VFWD regulations the following stipulations will apply:

(1) Shooting across, over, or within 10 feet of the traveled portion of any gravel road contemporaneously open to motor vehicle travel is prohibited in the interest of public safety (50 CFR 25.71 and 32.2 (l)).

(2) We allow only temporary tree stands and you must remove them (see 50 CFR 27.93) by the end of the final deer season. Your name and address must be clearly visible on the tree stand. We prohibit nails, screws, or screw-in climbing pegs to build or access a stand (See 50 CFR 32.2(i)).

(3) You must remove all blinds, decoys, shell casings, and other personal equipment and refuse from the refuge at the end of each day (see 50 CFR 27.93 and 27.94).

(4) We allow the use of retrieving, flushing, pointing, and pursuit dogs, however dogs must be under control as is reasonable and customary for that activity, such as voice command and/or remote telemetry (see 50 CFR 26.21).

(5) In order to monitor and mitigate potential disturbances to wildlife and neighboring land owners, any nighttime hunting (e.g., raccoon, coyote) will require a SUP issued by the wildlife refuge manager.

(6) We prohibit the use of all-terrain vehicles (ATV's or off road vehicles).

- We maintain a safe hunt by establishing safety/no hunt zones around refuge residences, buildings, and high-use public use trails, as necessary.
- Hunting outside of regular refuge hours requires a SUP.
- Provide visitors with general information on the hunting program and refuge-specific and State regulations through the refuge website, information signs, and a hunting brochure.
- In all materials related to the hunting program, promote and encourage the use of lead-free ammunition.
- Work with the State to identify and evaluate the impacts associated with requiring the use of non-toxic ammunition for hunting on refuge lands.

In order to protect Canada lynx during any potential interactions with hounds:

- The refuge and/or VFWD will maintain a contact list of those individuals training and/or hunting with pursuit hounds (bobcat, bear, coyote) on the refuge, as well as those training beagles.

  - Such list will provide an opportunity to share information regarding the identification of lynx and their sign and proper conduct when lynx are present (e.g., leashing and removing hounds from the area) as well as a means to contact users immediately should critical information become available (e.g., the discovery of a lynx den).

Given the uncertainty regarding the continued presence and breeding status of lynx at the Nulhegan Basin Division and the need to communicate lynx-related information with users, additional investigations will occur as part of the division's annual operations. Specifically, in collaboration with Service and VFWD personnel, scientific information regarding the status of lynx on the division will be collected by employing a combination of the following:

- Surveys to assess relative abundance of snowshoe hares, which may help managers to determine if adequate prey resources to support lynx reproduction are available.

- Snow track surveys to determine if lynx are present during late winter, which will indicate that Canada lynx have established home ranges on the division.

- Camera trap surveys to determine if lynx are present during periods of no snow cover.

- Telemetry studies of lynx to identify activity patterns, use areas, and important habitat features, such as denning sites.

In the future, the use may be restricted in timing and/or extent based on observations relating to the presence of lynx and potential impacts of the use to their life functions.

## JUSTIFICATION:

Hunting, when compatible, is defined as one of the priority public uses of the Refuge System by the National Wildlife Refuge System Improvement Act of 1997. Public hunting on Conte Refuge lands in Vermont will not have any significant impacts on the refuge environment, populations of hunted species, adjacent lands, or nearby residents. The refuge environment includes soils, vegetation, air quality, and water quality. Some disturbance to the soils and vegetation is expected in areas open to hunting, but impacts will be minimal due to the dispersed nature of the activity and the fact that soils are typically frozen and vegetation is dormant during most State hunting seasons. Hunting will benefit the composition, structure, and resiliency of the vegetation by keeping resident herbivore populations in balance with the carrying capacity of the habitat.

Disturbance to non-game wildlife will occur, however the impact will again be lessened because of the time of year hunting is permitted. Because the use is necessarily spatially dispersed and it occurs over the duration of the various State hunting seasons, any disturbance impacts will be tempered over an extended period of time and a larger area. These disturbance impacts will not materially affect the refuge's ability to fulfill its overall obligations to protect, conserve and manage fish, wildlife, or plant species as directed by the mission of the Refuge System or the refuge's legislated purposes. As documented in the intra-Service Section 7 consultation, hunting may affect, but is not likely to adversely affect any Federal-threatened or endangered species utilizing refuge lands. Likewise, the VFWD has concluded that a hunting program will not adversely affect any State-listed species.

Allowing hunting will provide a valued and traditional recreational opportunity to both local residents, people from across the State, and individuals from locations across the country. This activity and program produces a positive impact on refuge population and habitat management objectives, and purchases of food, fuel, lodging, and supplies contribute to the local economy.

Based on wildlife surveys and population estimates conducted by the State as well as the Service (in regards to migratory birds), wildlife which are harvested on refuge lands generate surplus populations and are able to sustain regulated harvest without impacting local or regional populations. Both the State and Service review harvest information annually to assess impacts on population levels and adjust, if necessary, regulations, take limits, and season lengths to assure the sustainable management of the species at the population level. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard an adequate, sustainable, and resilient breeding population from year to year. Hunting under State and Federal guidelines, as well as refuge-specific regulations, will not impact the populations of resident wildlife or migratory birds that the refuge protects and will not have adverse effects on the overall conservation of wildlife or their habitats on refuge lands. Based upon State and Federal regulations, the hunting program will operate under sound wildlife management principles and is in the public interest as directed under 50 CFR 32.1.

With regard to dog training, the outcome of the use is expected to be minimal trampling of vegetation and temporary displacement of wildlife, neither of which are expected to have long-term negative impacts on populations. The ability to communicate with houndsmen would allow for the sharing of lynx-related information and best practices when handling dogs in lynx habitat. If it is suspected that dog training may be having a negative impact on wildlife, the Service may propose a targeted research project to investigate the cause and effect of dog training on wildlife, which may lead to changes in or restrictions of the use. However, it is anticipated that dog training would not have a negative impact overall on resident wildlife or migratory birds (R. Dettmers, USFWS, pers. comm.) or the habitats they occupy.

In summary, the refuge hunt program on refuge-administered lands in Vermont will not have any appreciable impacts on the populations of hunted species, to the refuge environment, to other refuge users, to adjacent lands, or to nearby residents. By permitting public hunting the refuge is fulfilling the mission of the Refuge System by administering refuge resources for the benefit of present and future generations. For these reasons, we have determined that hunting will not materially interfere with nor detract from the fulfillment of the Refuge System mission or the purposes of the refuge.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 15-YEAR RE-EVALUATION DATE: _____

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# COMPATIBILITY DETERMINATION

## USE:

Interpretation, Environmental Education, Wildlife Observation, and Wildlife Photography

## REFUGE NAME:

Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge)

## DATE ESTABLISHED:

October 3, 1997

## ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- Silvio O. Conte National Fish and Wildlife Refuge Act (Public Law 102-212).
- Migratory Bird Conservation Act of 1929.
- Land and Water Conservation Fund Act of 1965.

## REFUGE PURPOSE(S):

- To conserve, protect, and enhance the Connecticut River populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- To conserve, protect, and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystem upon which these species depend within the refuge.
- To protect species, listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973 (ESA) as amended (16 U.S. 1531 et seq.).
- To restore and maintain the chemical, physical, and biological integrity of wetland and other waters within the refuge.
- To fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- To provide opportunities for scientific research, environmental education, and fish and wildlife oriented recreation and access to the extent compatible with the other purposes stated in this section.

## NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

## DESCRIPTION OF USE

**(a) What is the use? Is it a priority public use?**
The uses are interpretation, environmental education, wildlife observation, and wildlife photography. All four of these uses are priority uses of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). Visitors access the refuge and conduct these uses by walking, hiking, snowshoeing, cross-country skiing, bicycling on public roadways, and driving

motor vehicles (street registered vehicles) on public roads. On refuge divisions and units that allow boating and/or snowmobiling, some visitors engaged in these uses may access the refuge by boat or snowmobile. These uses are proposed on Conte Refuge to increase the public's knowledge, understanding, and appreciation of the refuge's natural resources and wildlife. By participating in these uses, we hope that visitors will support the refuge and Refuge System and be inspired to conserve natural resources.

**(b) Where will these uses be conducted?**
Wildlife observation and photography occur along refuge roads and trails, in parking areas, and in other areas open to public use. These uses will also occur in refuge facilities, as visitor contact stations, other onsite facilities, boardwalks, observation decks, and photography blinds. There are existing public use facilities at the Nulhegan Basin Division, Pondicherry Division, Putney Mountain Unit, and the Great Falls Discovery Center. Although these uses also occur on other existing refuge divisions and units, these other division and units do not have any existing public use infrastructure. The Dead Mans Swamp Unit in Connecticut and the Wissatinewag Unit in Massachusetts are closed to these uses to protect sensitive resources. The Mount Tom Unit in Massachusetts is also currently closed due to safety and vandalism concerns.

Interpretation and environmental educational programs, workshops, and talks will also occur in designated locations on refuge lands. Occasionally, these programs may occur in areas generally closed to the public. For example, special interpretive walks may be offered periodically at the Venture Smith Site located on the Salmon River Division due to its historical significance.

Some interpretation and environmental education will also occur off-refuge using the Watershed on Wheels Express (The WoW Express). The WoW express is a traveling visitor facility and outdoor classroom that visits schools and other venues throughout the Connecticut River watershed. This staffed vehicle houses interpretive exhibits about the refuge and watershed, and their natural resources.

In addition to existing refuge facilities and the WoW Express, we are proposing some additional public use facilities on existing refuge lands and lands proposed for future acquisition in the refuge's draft Comprehensive Conservation Plan (CCP). For example, at the Fort River Division, we are proposing to construct an outdoor classroom, as well as an Americans with Disabilities Act (ADA)-accessible trail. At the Roger Tory Peterson Unit, we propose to work the Friends Group and other partners to possibly renovate Roger Tory Peterson's former studio to serve as a visitor contact facility. As we acquire additional refuge lands, we propose to construct parking lots, kiosks, and ADA-accessible trails on each refuge division. We may also construct additional public use facilities (e.g., wildlife observation blinds, platforms, blinds, interpretive kiosks and panels, restrooms, etc.) on existing and proposed refuge lands to help facilitate these uses. Some projects may be subject to compliance with the National Environmental Policy Act of 1969 (NEPA) and may require an environmental assessment and additional public review and comment.

**(c) When will the uses be conducted?**
These uses occur on the refuge year-round, during refuge open hours. All refuge units are open daily from one-half hour before sunrise to one-half hour after sunset, with the following exceptions:

- The Nulhegan Basin Division (Brunswick, VT): The Nulhegan Basin Division is open 24 hours a day, 7 days a week for approved uses. The roads at the division are not plowed and many are used as snowmobile trails between December 15 to April 15, snow conditions permitting. During this time, only snowmobiles are allowed on the roads. All roads are closed to motor vehicle travel during mud season, which follows the snowmobile season and generally lasts until late May (until the roads and those of Plum Creek Timber Company, our northern neighbor are dry enough to support motor vehicles without causing damage to the road surface). Only pedestrian and bicycle use is allowed during mud season.

- The Third Island Unit (Deerfield, MA) is seasonally closed (January 1 through July 31) to protect nesting bald eagles.

- Both the Dead Man's Swamp (Cromwell, CT) and the Wissatinnewag Units (Greenfield, MA) are closed to the public at all times to protect sensitive resources. The Mount Tom Unit (Holyoke, MA) is also currently closed due to public safety and vandalism concerns.

Occasional guided evening programs may also be offered, including staff and/or trained volunteer-led, citizen science activities, such as the 24-hour bird count. Requests for these uses outside of these hours must be approved by the refuge and are subject to a SUP.

**(d) How will the uses be conducted?**
Visitors enter the refuge at public entry points or drive to refuge parking areas and generally walk from there. To participate in these activities, visitors may park vehicles at refuge parking areas, along the shoulders of designated refuge roads (Nulhegan Basin Division), and along public roads.

Visitors engaged in wildlife observation and photography generally hike along trails or in other areas open to the public or bicycle or drive along refuge roads. Visitors engaged in these uses will also use other public use facilities, such as visitor contact stations, boardwalks, observation decks, and photography blinds. In the winter, some visitors may also cross-country ski or snowshoe along refuge roads, trails, and other areas open to the public. Some visitors also access the Nulhegan Basin and Pondicherry Division by snowmobile or use motorized or non-motorized boats in designated areas, such as Lewis Pond at the Nulhegan Basin Division.

Wildlife observation and photography are typically self-guided and visitors engaged in these uses use refuge trails, viewing areas, informational material, photo blinds, and other areas open to the public. Wildlife observation may occur in the form of bird walks, and can be facilitated by binoculars often lent by the refuge or viewing scopes that may be installed in designated areas. The Nulhegan Basin and Pondicherry Divisions are both designated Important Bird Areas and draw many birders and photographers.

Interpretation and environmental education programs include presentations by staff, volunteers, teachers, and other youth leaders, and special events and displays both on and off the refuge (e.g.,WoW Express). These activities may include:

- Formal environmental education programs (e.g., teacher- or staff-led field trips).
- More informal environmental education programs (e.g., nature study).
- Interpretive talks and guided walks.
- Self-guided interpretation (e.g., interpretive panels along trails, interpretive displays, and exhibits in visitor centers, and interpretive brochures for trails).

Interpretive information will also be provided on signs and kiosks, in printed information (e.g., brochures), exhibits, and through audiovisual presentations, as well as social media outlets. Environmental education will be delivered through on- and off-site visits, including the use of the WoW Express and interaction with Adopt-a-Habitat partners.

The refuge will also periodically sponsor educational classes in nature photography and facilitate activities by local birding groups (e.g., the bird club at the Great Falls Discovery Center).

In addition to strategies to support these uses listed in the refuge's CCP, refuge staff will perform the following:

- Onsite evaluations to resolve public use issues.
- Monitoring and evaluation of impacts of the use on refuge resources.
- Maintenance of boundaries and signs.
- Meet with interested members of the public.

- Recruitment of volunteers.
- Preparation and presentation of interpretive and environmental education programs.
- Revision of interpretive and environmental materials.
- The creation and installation of interpretive kiosks.

**(e) Why are these uses being proposed?**
The Refuge System Improvement Act defines wildlife observation, photography, environmental education, and interpretation as priority public uses. Priority public uses, if found compatible on a refuge, are to receive our enhanced consideration over other general public uses. Authorizing these uses will provide opportunities for the public to enjoy wildlife and plants on the refuge in accordance with law, and it will produce better-informed public advocates for U.S. Fish and Wildlife Service (Service) programs.

These uses provide opportunities for visitors to observe and learn about wildlife, wildlands, and cultural resources at their own pace and observe wildlife in their natural habitats. These four priority uses provide visitors with opportunities to enjoy refuge resources and gain a better understanding and appreciation of fish and wildlife, wildlands ecology, the relationships of plant and animal populations in an ecosystem, and wildlife management. These activities will enhance the public's understanding of natural resource management programs and ecological concepts, enable the public to better understand and connect with the problems facing our wildlife and wildlands resources, help visitors to better understand how they affect wildlife and other natural resources, learn about the Service's role in conservation and restoration, and forge relationships that will aim to encourage the pubic to take action for the sake of the environment.

Photographers will have opportunities to photograph wildlife in its natural habitat. These opportunities will increase the publicity and advocacy of Service programs. Photography provides wholesome, safe, outdoor recreation in a scenic setting, and entices those who come strictly for recreational enjoyment to participate in the educational facets of our public use program and become advocates for the refuge and the Service.

Visitors need a way to access these priority uses. By allowing visitors to walk, hike, cross-country ski, snowshoe, bicycle, boat, snowmobile, and drive automobiles in designated areas of the refuge, we are providing access to these important priority public uses with minimal impacts to sensitive wildlife and habitat.

Continuation of these programs helps the Service meet the Refuge System's goal, "to provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment."

## AVAILABILITY OF RESOURCES

The following list estimates the required costs for the refuge to administer and manage its current programs for wildlife observation and photography, environmental education, and interpretation. Costs associated with administering this use includes assessing the need for road and trail maintenance and repair, maintaining kiosks, gates, and traffic counters, recording collected data, maintaining signs/posting roads and trails, informing the public about the range of refuge uses, conducting visitor use surveys, analyzing visitor use patterns, monitoring the effects of public uses on refuge resources and visitors, and providing information to the public about the use. Such costs do not include the costs of new infrastructure construction, interpretive panels, signs and other costs as described in the CCP. They also do not cover unanticipated costs such as participation in search and rescue operations. The refuge's federal wildlife officer is the primary contact for any emergency operations on the refuge, however local resources are available to assist and provide resources if necessary. Because such incidents are uncommon and unpredictable, these costs are not assumed in the resources estimate below. The use of refuge staff to develop and monitor public uses and engage visitors is required for administering all refuge public uses. Therefore, these responsibilities and related equipment are accounted for in budget and staffing plans.

We estimate below the annual costs associated with the administration of these uses on the refuge.

| | |
|---|---|
| *Program Oversight* (wildlife refuge manager): | $8,000 |
| *Interpretive Program Development, Environmental Education Coordination, Development of Interpretive Exhibits and Brochures* (visitor services manager): | $12,000 |
| *Special Use Permits/Monitoring Resource Impacts* (wildlife biologist): | $1,200 |
| *Provide Public Information/Visitor Safety* (Federal wildlife officer): | $3,500 |
| *Trail and Parking Lot Maintenance* (Youth Conservation Corps): | $35,000 |
| *Staff and Support for the WOW Express:* | $30,000 |
| **Total Annual Cost of Program:** | **$89,700** |

The financial and staff resources necessary to provide and administer these uses at their current levels are now available. We expect the resources to continue in the future, subject to availability of appropriated funds. As stated above, we will need additional resources to expand and enhance these uses as described in the CCP.

## ANTICIPATED IMPACTS OF THE USE

Following are descriptions of potential adverse effects on natural resources of interpretation, environmental education, wildlife observation, and wildlife photography, accessed by walking, hiking, cross-country skiing, snowshoeing, and boating in designated refuge areas and bicycling and driving on public roads. Effects of snowmobile access are addressed in a separate compatibility determination.

**Effects on Hydrology and Water Quality:** Visitor use has the potential to negatively impact lakes, ponds, streams and the major tributaries of the Connecticut River. Exposed soils on hiking trails may increase sediments in near-by waterways, and petroleum products may be introduced by boating activity and run-off from parking lots and roads. However, overall we do not anticipate any major impacts to hydrology and water quality because these uses are limited to designated areas only, current and projected levels of use are relatively low, and we will build, maintain, and monitor trails and roads in such ways as to minimize impacts.

Refuge visitors are encouraged to use refuge trails and roads. The majority of visitors hike along designated trails, roads, and former logging roads. Buffers will be required on trails that are adjacent to waterways to decrease bank erosion, and filter contaminants before they enter waterbodies. Boardwalks will provide a path for users to cross over the wetlands or streams and not through them, thereby minimizing long-term adverse effects to hydrology and water quality. In addition, refuge staff will routinely monitor roads, trails, and boardwalks for damage and remediate problem areas as needed.

Motorized and non-motorized boating would occur on designated refuge waterbodies. The most likely locations for motor boating are Lewis Pond at the Nulhegan Basin Division and McConnell Pond, which is proposed for addition to this division. The use of motorboats is currently estimated at one to two boats per week. This low level of use is expected to continue into the future and is expected to have only minimal impacts to water quality. Boat speeds are not to exceed 5 miles per hour, so boat wakes and the associated erosion is not anticipated.

There is the potential for bicycles and cars traveling on refuge roads to impact refuge wetlands through increased soil erosion, sedimentation, and run-off or from contaminants from cars (e.g., oil and antifreeze). To minimize these impacts, cars and bicycles are only allowed on designated roads. At current and anticipated levels of use, we do not expect any greater than negligible impacts from cars and bicycles on refuge hydrology and wetlands. Refuge parking lots will not be located directly adjacent to streams, rivers, or other wetlands. Additionally, where feasible, parking lots will be constructed of gravel, which is more porous than impervious surfaces such as asphalt, and therefore would result in lower levels of runoff and sedimentation.

Plans for a new outdoor classroom at the Fort River Division should not have impacts due to using already disturbed area. Trails, kiosks, and possible outdoor classrooms may cause short-term adverse impacts from soil runoff and sedimentation into the refuge's water resources. A more detailed discussion of the impacts of these construction projects will be addressed in a subsequent environmental assessment.

**Effects on Vegetation**: To facilitate interpretation, environmental education, wildlife observation and wildlife photography, we will allow hiking, cross-country skiing, and snowshoeing access on designed trails and other areas open to the public and bicycle and automobile access on designated roads. Short-term effects consist of the deterioration of plant material, whereas long-term effects of trampling include direct and indirect effects on vegetation and soils like diminishing soil porosity, aeration, and nutrient availability through soil compaction (Kuss 1986, Roovers et al. 2004). Compaction of soils thus limits the ability of plants, particularly rare and sensitive species, to revegetate affected areas (Hammitt and Cole 1998). Kuss (1986) found that plant species adapted to wet or moist habitats are the most sensitive and increased moisture content reduces the ability of the soil to support recreational traffic. Where adverse impacts to vegetation are observed, the refuge will take necessary measures, such as remediation and trail closures, to restore plant communities.

It is anticipated that allowing foot traffic on the refuge will cause some vegetation loss, increased tree root exposure and trampling effects, however we will minimize the potential for impacts to vegetation by allowing these uses in designated areas open to the public. The majority of visitors stay on trails and roads. Off-trail use could have impacts to adjacent vegetation; however, we will encourage users to remain on existing trails (where they exist) and roads. Also, off-trail use is generally dispersed and occurs at low levels. It is also anticipated that under current and projected use the incidence of these problems will be minor. Some rare plants have been documented in habitat adjacent to trails, however, designated routes do not have any known occurrences of rare plant species on their surface or soils subject to compaction that will be impacted by this use. Because cross-country skiing and snowshoeing only occur during the winter, when plants are dormant and the ground is covered with snow, we anticipate negligible impacts to vegetation from cross-country skiing and snowshoeing. We will not allow bicycles or automobiles off of refuge roads. Refuge staff will monitor all trails, identify problem areas, and conduct appropriate restoration and protection efforts.

**Effects on Soils**: Visitor use on the refuge could adversely impact soils through compaction, erosion, and sedimentation. In general, we will minimize these impacts by encouraging users to stay on trails and roads and in other areas open to the public. We may close areas to the public either seasonally or permanently to minimize impacts to sensitive wildlife and habitats. We expect impacts to soils to be minor to negligible because the majority of use occurs on refuge trails and roads; off-trail use occurs at low levels and is dispersed.

In areas where new construction will be necessary (e.g., observation platforms, environmental education pavilion, parking lots, kiosks, roads, and trails) localized soil compaction and loss of productive soil will occur. These impacts will constitute unavoidable adverse impacts from refuge infrastructure improvements but will be short-term and temporary as restoration and revegetation of construction sites will be prioritized. Additionally, trail construction projects may cause temporary disturbance to improve trails but will lead to more stable and sustainable trails over the long term. For example, boardwalks will be constructed over sensitive wetlands to mitigate long-term impacts to wetland communities, but short-term impacts may be created during the construction phase.

Several new trails are proposed at the Nulhegan Basin Division. Two will connect to already existing trails–the Nulhegan River Trail and a proposed riverside campsite and a connector trail between Lewis Pond Overlook and the Green Mountain Club's Gore Mountain Trail. The Nulhegan River Trail spur will be approximately 500 feet long and the Gore Mountain Trail spur will be roughly 1.4 miles long. In addition, a new loop trail is planned extending from the Lewis Pond Overlook. This trail will use 0.5 miles of existing cleared trail, with 0.8 miles of new trail tread. At the Putney Mountain Unit, two trail segments are proposed to provide a linkage between existing trails on the unit and the Putney Mountain Association's larger trail network. All of these will be primitive trails, with an 18-inch mineral surface tread and 3-foot wide cleared path to minimize vegetation clearing. As warranted, impacts of new trail construction not currently under consideration will be evaluated in a supplemental environmental assessment(s).

**Effects on Wildlife**: Short-term and long-term adverse impacts will be expected for wildlife populations in relation to increasing trail miles and visitor use. However, we do not anticipate any major, long-term impacts on wildlife from allowing these uses because current and projected levels of use are relatively low and these uses are only allowed in designated areas open to the public.

Disturbances to wildlife will vary by wildlife species involved and the type, level, frequency, duration, and the time of year activities occur. Beale and Monaghan (2004) found that adverse effects to wildlife increase as number of users increase. The study found that an animal's response to one visitor walking down a trail is entirely different than its response to a group of users walking down a trail. The refuge recognizes that large group sizes may amplify negative effects to wildlife. Therefore, groups larger than 10 are required to notify the

refuge prior to visiting to determine if a SUP would be needed. This will enable the refuge to understand which trails are preferred by large groups, and to monitor any potential excessive wildlife disturbance created by large groups. Having the ability to monitor these kinds of disturbances will also enable the refuge to mitigate impacts associated with large groups. Examples of mitigation may include directing large groups to less sensitive habitats during breeding seasons or assigning refuge staff to lead or meet with the group while on refuge lands.

Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. In this study, common species (e.g., American Robins) were found near trails and rare species (e.g., Blackburnian warblers) were found farther from trails. In some cases there is a clear link between the extent of disturbance and either the survival or reproductive success of individuals (e.g., Schulz and Stock 1993), but in many cases disturbance act in a more subtle way, by reducing access to resources such as food supplies or nesting sites (Gill et al. 1996). Bird flight in response to disturbance can lower reproductive success by exposing individuals and nests to predators. For recreation activities that occur simultaneously (hiking, biking, and horseback riding) there will likely be compounding negative impacts to wildlife (Knight and Cole 1991).

Evidence suggests that species most likely to be adversely affected are those where available habitat is limited thus constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 2001). Species that are sensitive to human disturbance with specialized habitat requirements include bald eagles, peregrine falcons, and American black ducks (DeGraff et al. 2001, Longcore et al. 2000). Limiting or closing recreational use within the vicinity of nest sites during the breeding season will mitigate impacts to these species. For example, the Third Island Unit of the refuge is closed to these uses to protect bald eagles during the sensitive breeding season. Additionally, trail development has striven and will continue to avoid sensitive habitats.

Wildlife disturbance may be compounded by seasonal needs. For example, causing mammals to flee during winter months would consume stored fat reserves that are necessary to get through the winter. Hammitt and Cole (1998) found white-tailed deer females with young are more likely to flee from disturbance than those without young. Some species, like warblers, would be negatively affected by disturbance associated with bird watching particularly during the breeding season.

For songbirds, Gutzwiller et al. (1994) found that low levels of human intrusion altered the singing behavior of some species. Disturbance may also affect the reproductive fitness of males by hampering territory defense, mate selection, and other reproductive functions of vocalizations (Arrese 1987). Disturbance, which leads to reduced singing activity, makes males rely more heavily on physical deterrents, which are time- and energy-consuming in defending territories (Ewald and Carpenter 1978).

Short-term localized adverse impacts to fish populations may result from refuge construction and restoration projects that might cause soil erosion and sedimentation into refuge waterways. Long-term adverse impacts from increased trail miles and trail use might pose another concern to refuge fisheries. Trails that have stream and river crossings will likely degrade over time with increased use and contribute to downstream sedimentation and turbidity, which has been found to be a stressor to brook trout (Sweka and Hartman 2001) and redside dace (Holm and Crossman 1986) populations that are sensitive to habitat degradation. Buffers will be required for trails located along riparian areas to decrease erosion of river banks, and filter contaminants before they enter waterways. The refuge will monitor stream and river crossings closely and remediate any damaged areas to minimize adverse impacts associated with trail use.

Refuge visitors who choose to boat may cause localized, minor, short-term impacts by disturbing the bottom substrate in shallow water. In addition, discarded items such as plastic containers present a risk for waterfowl and other birds. As mentioned earlier, we expect these impacts to be negligible due to very low number of boaters on the refuge.

We will take all necessary measures to minimize all of these impacts, particularly where group educational activities are involved. We will evaluate the sites and programs periodically to assess whether they are meeting the objectives, and to prevent site degradation. If evidence of unacceptable adverse impacts appears, we

will rotate the activities to secondary sites, or curtail or discontinue them. If necessary, we will close areas seasonally around active bird nesting sites and avoid recreational use of areas where federally listed species occur to minimize or eliminate human disturbance. We will post and enforce refuge regulations, and establish, post, and enforce closed areas.

## PUBLIC REVIEW AND COMMENT:

As part of the CCP planning process for Conte Refuge, this compatibility determination will undergo extensive public review, including a public comment period of at least 60 days following the release of the Draft CCP/ Environmental Impact Statement (EIS). It will also undergo an additional 30 days of review after release of the Final CCP/EIS.Determination (check one below):

## DETERMINATION (CHECK ONE BELOW):

____ Use is not compatible

__X__ Use is compatible, with the following stipulations

## STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge has developed a list of criteria for determining whether any given route (e.g., trail, road, etc.) would be appropriate for interpretation, environmental education, wildlife observation, and wildlife photography. These criteria apply to current and future trails and are designed to help minimize negative impacts to soils, vegetation, and wildlife and to provide high-quality experiences to visitors. Criteria are as follows:

### Checklist for Existing Routes to Be Eligible for Compatibility Consideration

*(Routes must meet all criteria)*

(1) The route provides an opportunity to view a variety of habitats and wildlife.

(2) The route is safe for the proposed types and amount of use.

(3) The route requires minimal annual maintenance (e.g., use waterbars and stepping stones, etc., to reduce soil and hydrology impact) to ensure safe access and to prevent further habitat degradation.

(4) The route has a low potential for fragmenting habitat or disturbing wildlife populations.

(5) Based on existing soils information, less than 50 percent of the route's length occupies soil types rated as high or very high for compaction and/or erosiveness. The route is not rated as severely limited for hiking trails based on appropriate county soil surveys.

(6) Any route crossing of sensitive soils occupies the shortest possible distance. Organic soil crossings are minimized or eliminated.

(7) Continued use of the existing route is not likely to cause further wetland alteration or degradation. There is low risk that hydrology, soil stability, sensitive plant communities, riparian zones, and wildlife habitats would be adversely affected.

(8) The route predominately occupies previously modified substrate (graveled, compacted, or filled), such as former logging roads and rail grades.

(9) The route is not incised more than 1-foot deep over 10 percent of its total length.

## Additional stipulations that will apply to ensure compatibility include:

- Refuge regulations will be posted at trailheads and entrance kiosks and enforced. Closed areas will be established as needed, posted, and enforced. Signs necessary for visitor information, safety, and traffic control will be kept up to date.
- The known presence of a threatened or endangered species will trigger discussions with the Service's New England Field Office prior allowing any new use of an area.
- We will choose locations for public uses to minimize impacts to wildlife and habitat. We will periodically evaluate sites and programs to assess whether objectives are being met and to prevent site degradation. If evidence of unacceptable adverse impacts appears, the location(s) of activities will be rotated with secondary sites or the use will be reduced or discontinued.
- Bicycles and automobiles are only allowed on designated refuge roads. Bicycles and automobiles are not allowed on refuge trails or offroad.
- All-Terrain Vehicles (ATVs) and other off-road vehicles are not permitted in the refuge.
- Boating may only occur in designated waterways and boat operators must obey posted speed limits.
- Visitors engaged in walking, hiking, snowshoeing, and cross-country skiing are encouraged to stay on designated refuge trails and roads, where these exist.
- These uses are restricted to refuge open hours: one-half hour before sunrise until one-half hour after sunset (except the Nulhegan Basin Division, which is open 24 hours a day for individuals engaged in these approved uses).
- The refuge conducts an outreach program to promote public awareness and compliance with public use regulations on the refuge.
- Group size is encouraged to be no more than 10 persons to promote public safety, accommodate other users, and reduce wildlife disturbance. Groups larger than 10 persons must contact the refuge office prior to visiting the refuge so that staff can determine if the group will require a SUP. Groups traveling only on roads shared with vehicles are not required to contact the refuge office or obtain a SUP.
- All routes designated for public access are annually inspected for maintenance needs. Prompt action is taken to correct any conditions that risk public safety. Roads and trails are maintained at a level that reasonably accounts for safe travel. Roads are not plowed in winter.
- Guidelines to ensure the safety of all participants will be issued in writing to any special use permit holder for the activities and will be reviewed before the activity begins.
- Routes designated for public access are monitored periodically to determine if they continue to meet the compatibility criteria (listed above) established by the refuge. Should monitoring and evaluation of the use(s) indicate that the compatibility criteria are or will be exceeded, appropriate action will be taken to ensure continued compatibility, including modifying or discontinuing the use.
- Routine law enforcement patrols are conducted throughout the year. The patrols promote education and compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interaction.
- Potential conflicts with other public uses such as hunting will be minimized by using trailhead signs and other media to inform the visitors about current public use activities as well as which activities are authorized in specific locations throughout the refuge.

## JUSTIFICATION

Interpretation, environmental education, wildlife observation, and wildlife photography are all priority public uses and are to receive enhanced consideration on national wildlife refuges, according to the Refuge Improvement Act of 1997. Providing increased wildlife-dependent recreational opportunities promotes visitor appreciation and support for refuge programs, as well as habitat conservation efforts in the Connecticut River watershed.

Wildlife observation, photography, environmental education, and interpretation activities generally support refuge purposes and impacts can largely be minimized (Goff et al. 1988). Interpretation and environmental education can also help to develop a resource protection ethic within society. They allow us to educate refuge visitors about endangered and threatened species management, wildlife management, ecological principles and ecological communities. Environmental education and interpretation also instill an 'ownership' or 'stewardship' ethic in visitors. These uses strengthen Service visibility in the local community.

The majority of visitors to the refuge come to view and/or photograph wildlife and habitats. There will be some visitor impacts from this activity, such as trampling vegetation (Kuss and Hall 1991) and disturbance to wildlife (Burger 1981, Klein, 1989); however, stipulations to ensure compatibility will make these impacts minimal. For example, we encourage visitors to stay on trails and roads and, if necessary, will close areas to these uses to protect sensitive habitats (e.g., wetlands) and wildlife (e.g., breeding birds).

By encouraging visitors to stay in designated areas open to the public, impacts to vegetation, soils, hydrology, wetland communities, wildlife, and ecological integrity of the refuge will be minimized. Because the majority of visitors use designated trails and roads on a small percentage of the refuge, disturbance will be limited and manageable. Through proper trail maintenance these impacts will be further reduced. Hydrologic and soil impacts were generally inherited with refuge lands and are being remediated through routine maintenance operations. These uses will not affect the refuge's ability to restore impacted lands nor will they materially increase sedimentation, erosion, or hydrologic impacts on refuge lands. Also, current and projected future levels of use are low, so we expect impacts to refuge soils, wildlife, and vegetation to be minor. We also have stipulations in place to further reduce impacts to refuge resources, such as limiting group sizes, closing sensitive areas, if necessary, to public use, and guidelines for designing and future trails.

These uses will not have an effect on threatened or endangered species, because these uses will not be allowed in areas where known federally listed species exist. For example, we have closed the refuge's Dead Man's Swamp Unit to prevent impacts to the federally threatened Puritan tiger beetle. Wherever listed plants or wildlife occur, we will close these areas to visitor use. The refuge will work with the Service's Ecological Services Office to ensure that no adverse effects will occur. We will insure that no trails or human impacts will be allowed in the areas where these species either exist or have been sited.

For these reasons, allowing these uses will detract from the refuge's purposes, the Fish and Wildlife Act (1956), or the mission of the Refuge System for conserving, managing, restoring, and protecting wildlife resources. Based on this information, we have determined that environmental education and interpretation and wildlife observation and photography will not materially interfere with or detract from the mission of the Refuge System or the purposes for which the refuge was established.

## SIGNATURE:

Refuge Manager: _____ _____
(Signature) (Date)

## CONCURRENCE:

Regional Chief: _____ _____
(Signature) (Date)

## MANDATORY 15-YEAR RE-EVALUATION DATE: _____

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Appendix E

Tom LaPointe/USFWS

*Nulhegan Basin Division, Vermont*

# Wilderness Review


- 1. Introduction
- 2. Wilderness Inventory
- 3. Summary of Wilderness Inventory Findings
- 4. Wilderness Study
- 5. Alternatives Considered but Eliminated from Consideration

## 1. Introduction

The purpose of a wilderness review is to identify and recommend to Congress, lands and waters of the National Wildlife Refuge System (NWRS) that merit inclusion in the National Wilderness Preservation System (NWPS). Wilderness reviews are required elements of comprehensive conservation plans (CCP), are conducted in accordance with the refuge planning process outlined in the U.S. Fish and Wildlife Service (Service) Manual (602 FW 1 and 3), and include compliance with the National Environmental Policy Act (NEPA) and public involvement.

The wilderness review process has three phases: inventory, study, and recommendation. During the inventory phase, the wilderness review team categorizes lands and waters into Wilderness Inventory Areas (WIAs) and evaluates them to determine if the minimum criteria for wilderness is met. WIAs that meet the minimum criteria are considered Wilderness Study Areas (WSAs) and are further assessed during the wilderness study phase. During the study phase, a range of management alternatives is evaluated to determine if a WSA is suitable for wilderness designation, or whether a WSA should be managed under an alternate set of goals and objectives that do not involve wilderness designation.

During the recommendation phase, the review team decides whether to recommend a WSA to Congress for wilderness designation. If the team decides that any WSAs merit wilderness designation, they report their recommendations to Congress in a wilderness study report. The wilderness study report is prepared after the record of decision for the final CCP has been signed. Areas recommended for designation are managed to maintain wilderness character in accordance with management goals, objectives, and strategies outlined in the final CCP until Congress makes a decision, or the CCP is amended to modify or remove the wilderness proposal.

This wilderness review was produced from an inventory of the refuge's lands and waters. The process involved combining site knowledge with existing land status maps, photographs, available land use information, and road inventory data to determine if refuge lands and waters meet the minimum criteria for wilderness. Geographic Information System (GIS) software was used to conduct spatial and temporal data analysis, which allowed interpretation of such things as habitat conditions, natural communities, cultural features, human footprint, road locations, and other informational needs.

## 2. Wilderness Inventory

### *2.1. Introduction*

The wilderness inventory is a broad look at each planning area (WIA) to identify potential WSAs. A WSA is an area of undeveloped Federal land that retains its primeval character and influence, without permanent improvements or human habitation, and further, meets the minimum criteria for wilderness as identified in Section 2(c) of the Wilderness Act. This evaluation was performed for all of the refuge's divisions and units on lands owned in fee title.

### *2.2. Minimum Wilderness Criteria*

A WSA is required to be a **roadless** area or an island of any size, meet the **size** criteria, appear **natural**, and provide for **solitude or primitive recreation**.

***Roadless***: Roadless refers to the absence of improved roads suitable and maintained for public travel by motorized vehicles primarily intended for highway use. A route maintained solely by the passage of vehicles does not constitute a road. Only Federal lands are eligible to be considered for wilderness designation and inclusion within the NWPS.

The following factors were the primary considerations in evaluating the roadless criteria:

- The area does not contain improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use.
- The area is an island, or contains an island, that does not have improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use.
- The area is in Federal fee title ownership.

***Size***: The size criteria can be satisfied if an area has at least 5,000 acres of contiguous roadless public land, or is sufficiently large that its preservation and use in an unimpaired condition is practicable.

The following factors were the primary considerations in evaluating the size criteria:

- An area of more than 5,000 contiguous acres. State and private lands are not included in making this acreage determination.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management.

***Naturalness***: The Wilderness Act, Section 2(c), defines wilderness as an area that "generally appears to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable." The area must appear natural to the average visitor, rather than "pristine." The presence of historic landscape conditions is not required.

An area may include some human impacts provided they are substantially unnoticeable in the unit as a whole. Significant hazards caused by humans, such as the presence of unexploded ordnance from military activity and the physical impacts of refuge management facilities and activities are also considered in evaluating the naturalness criteria.

An area may not be considered unnatural in appearance solely on the basis of the sights and sounds of human impacts and activities outside the boundary of the unit. The cumulative effects of these factors in conjunction with land base size, physiographic and vegetative characteristics were considered in the evaluation of naturalness.

The following factors were the primary considerations in evaluating the naturalness criteria:

- The area appears to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable.
- The area may include some human impacts provided they are substantially unnoticeable in the unit as a whole.
- The absence of significant hazards caused by humans, such as unexploded ordnance from military activity.
- The presence of physical impacts of refuge management facilities and activities.

***Solitude or Primitive and Unconfined Recreation:*** A WSA must provide outstanding opportunities for solitude or primitive and unconfined recreation. The area does not have to possess outstanding opportunities for both solitude and primitive and unconfined recreation, and does not need to have outstanding opportunities on every acre. Further, an area does not have to be open to public use and access to qualify under this criteria; Congress has designated a number of wilderness areas in the National Wildlife Refuge System that are closed to public access to protect resource values.

Opportunities for solitude refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. These primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance, and adventure. These two elements are not well defined by the Wilderness Act, but can be expected to occur together in most cases. However, an outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for recreation use that the ability to experience solitude is compromised.

The following factors were the primary considerations in evaluating the criteria for outstanding opportunities for solitude or primitive unconfined recreation:

- The area offers the opportunity to avoid the sights, sounds and evidence of other people. A visitor to the area should be able to feel alone or isolated.

- The area offers non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport.

***Supplemental Values***: The Wilderness Act states that an area of wilderness may contain ecological, geological, or other features of scientific, educational, scenic or historical value. Supplemental values of the area are optional, but the degree to which their presence enhances the area's suitability for wilderness designation should be considered. The evaluation should be based on an assessment of the estimated abundance or importance of each of the features.

### 3. Summary of Wilderness Inventory Findings

The wilderness review team reviewed the eight divisions and eight units (table E.1) within the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge) to determine if they met the minimum wilderness criteria stipulated in law and Service policy, and if so, should be further assessed in the Wilderness Study phase of this review. Of the divisions, only Nulhegan Basin and Pondicherry were large enough to meet the minimum size criteria and, therefore, are further evaluated in this review. None of the units met the minimum size criteria; however, the Third Island Unit is a roadless island and is, therefore, further evaluated in this review.

**Table E.1. Conte Refuge Divisions and Units**

| Name* | Location | Class | Acreage |
|---|---|---|---|
| Deadman's Swamp | Connecticut | Unit | 31 |
| Roger Tory Petersen | Connecticut | Unit | 56 |
| Honeypot Wetlands | Massachusetts | Unit | 21 |
| Wissatinnewag | Massachusetts | Unit | 21 |
| Mt Tom | Massachusetts | Unit | 141 |
| Mt Toby | Massachusetts | Unit | 30 |
| **Third Island** | **Massachusetts** | **Unit** | **4** |
| Putney Mountain | Vermont | Unit | 285 |
| Salmon River | Connecticut | Division | 425 |
| Dead Branch | Massachusetts | Division | 97 |
| **Nulhegan Basin** | **Vermont** | **Division** | **26,605** |
| Fort River | Massachusetts | Division | 249 |
| Mill River | Massachusetts | Division | 249 |
| Westfield River | Massachusetts | Division | 125 |
| **Pondicherry** | **New Hampshire** | **Division** | **6,405** |
| Blueberry Swamp | New Hampshire | Division | 1,166 |
| **Total** | | | **35,910 acres** |

* *Note: The refuge divisions and unit listed in* **bold** *meet the size criteria and are evaluated further as to whether they meet other minimum wilderness criteria.*

### *3.1. Third Island Unit*

This island was donated to the Service by the Connecticut River Watershed Council in 1997 and served to formally establish the refuge. It is a 4-acre island in the Connecticut River, in Deerfield, Massachusetts. Third Island is natural in appearance and roadless, but it is small in size and within a quarter mile of numerous roads, houses, and farm fields, thereby precluding the opportunity for solitude and primitive, unconfined recreation. The wilderness review team found that this island does not possess wilderness characteristics and supplemental values that warrant additional evaluation.

***Wilderness Inventory Conclusion for Third Island Unit***

The wilderness review team did not identify any WIAs on the Third Island Unit and the unit in its entirety does not meet all of the minimum wilderness criteria. We will not evaluate Third Island unit in the Wilderness Study phase of this wilderness review.

### *3.2. Pondicherry Division*

The wilderness review team identified six WIAs that comprise nearly 70 percent of the division (map E.1). Twelve other portions are isolated by roads and are therefore considered roadless, but each is less than 500 acres and will not be further evaluated as a WIA. The WIAs were defined by highways, interior powerline rights-of-way, railroad tracks, and other non-federally owned lands.

All of the WIAs were evaluated to determine if they meet the minimum wilderness criteria and should be further assessed in the wilderness study phase of this review. The wilderness review team found none of the WIAs to be larger than 5,000 acres (table E.2), and given the widespread application of clear-cutting harvests roughly 20 years ago, none of them possess wilderness characteristics and supplemental values that warrant additional evaluation.

**Table E.2. Silvio O. Conte National Fish and Wildlife Refuge, Pondicherry Division Wilderness Inventory Areas**

| Wilderness Inventory Area (WIA)* | Size** |
|---|---|
| WIA 1 | 2,269 acres |
| WIA 2 | 885 acres |
| WIA 3 | 400 acres |
| WIA 4 | 209 acres |
| WIA 5 | 904 acres |
| WIA 6 | 635 acres |

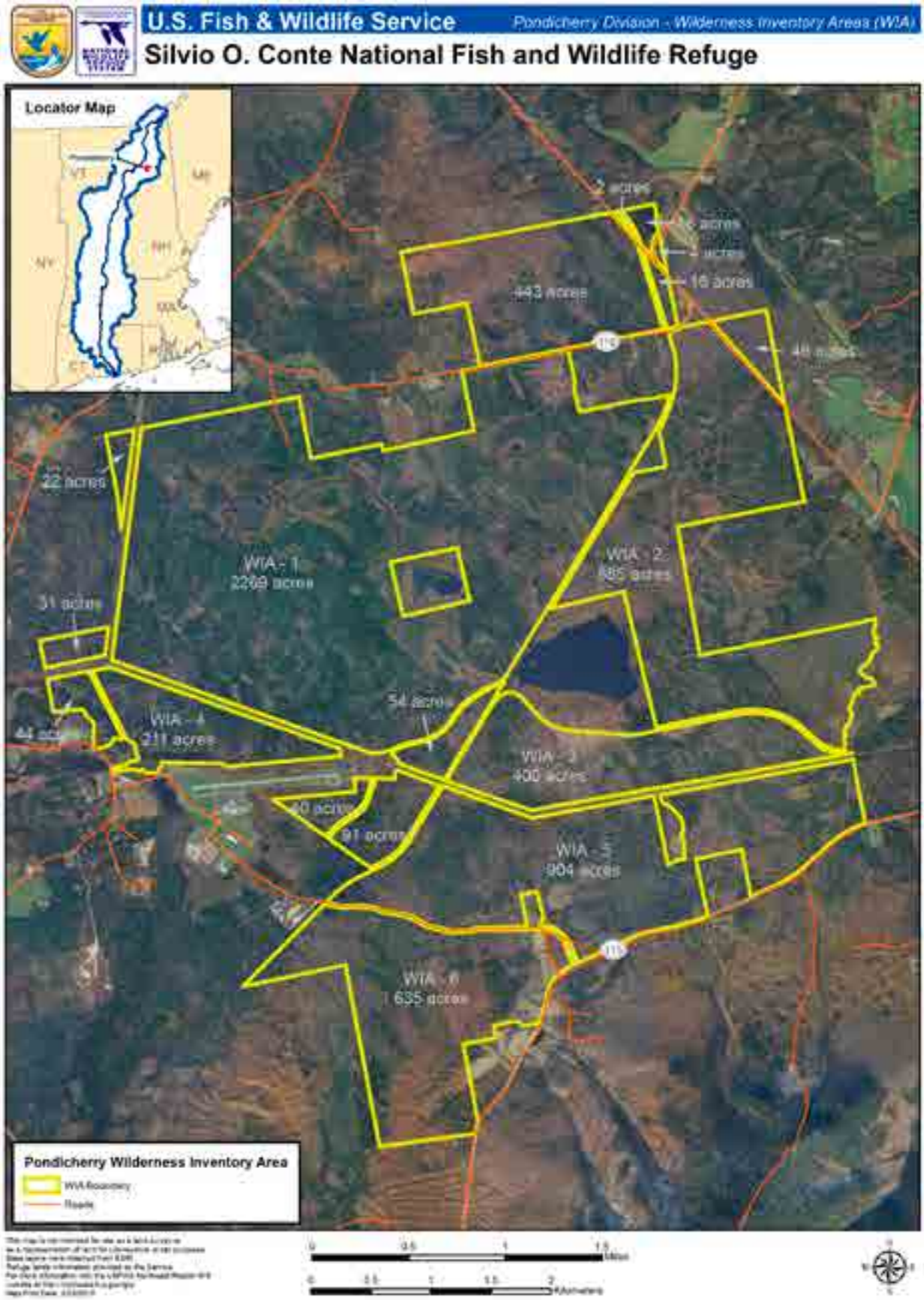
** All Wilderness Inventory Areas are in fee title ownership.*

*** Acreage is approximate.*

***Wilderness Inventory Conclusion for Pondicherry Division***

The wilderness review team identified six WIAs within the approved acquisition boundary of the division and determined that none of the WIAs meet all of the minimum wilderness criteria. We will not evaluate any of the Pondicherry Division WIAs in the wilderness study phase of this wilderness review.

*Map E.1. Wilderness Inventory Areas – Pondicherry Division*



### *3.3. Nulhegan Basin Division*

The wilderness review team identified 11 WIAs within the approved acquisition boundary of the Nulhegan Basin Division (division) (map E.2).

The WIAs were primarily defined by the network of existing improved gravel roads on the division. These roads define the extent of parcels that meet the requirements of a roadless area and, therefore, are well suited for use as WIA perimeter boundaries. Alternate road placements, including potential future decommissioning of roads, were evaluated to determine if perimeter boundaries could be altered to increase the size of the WIAs, while maintaining the area as roadless. Such reconfiguration was not possible given the deeded rights-of-way held by neighboring landowners across the following through-roads: Lewis Pond, Lewis Pond Overlook, Tim Carroll Brook, Four Mile, Eagle's Nest, Tin Shack, Canal, and Stone Dam. No alternative road layouts were therefore identified that would meet refuge management or public access objectives, abide by legal access obligations, and result in a WIA becoming eligible as a WSA based on the roadless criteria alone.

All of the WIAs were evaluated to determine if they met the minimum wilderness criteria and should be further assessed in the wilderness study phase of this review. The wilderness review team found one WIA to be larger than 5,000 acres (WIA 4, table E.3) and one WIA that is less than 5,000 acres (WIA 3) yet possesses wilderness characteristics and supplemental values that warrant additional evaluation. While substantially larger than WIA 3, WIA 8 is less than 5,000 acres and lacks naturalness or other associated wilderness values due to extensive logging within the past 20 to 30 years and is not considered further. A narrative description of the two WIAs that warranted further evaluation, WIA 3 and WIA 4, is included below.

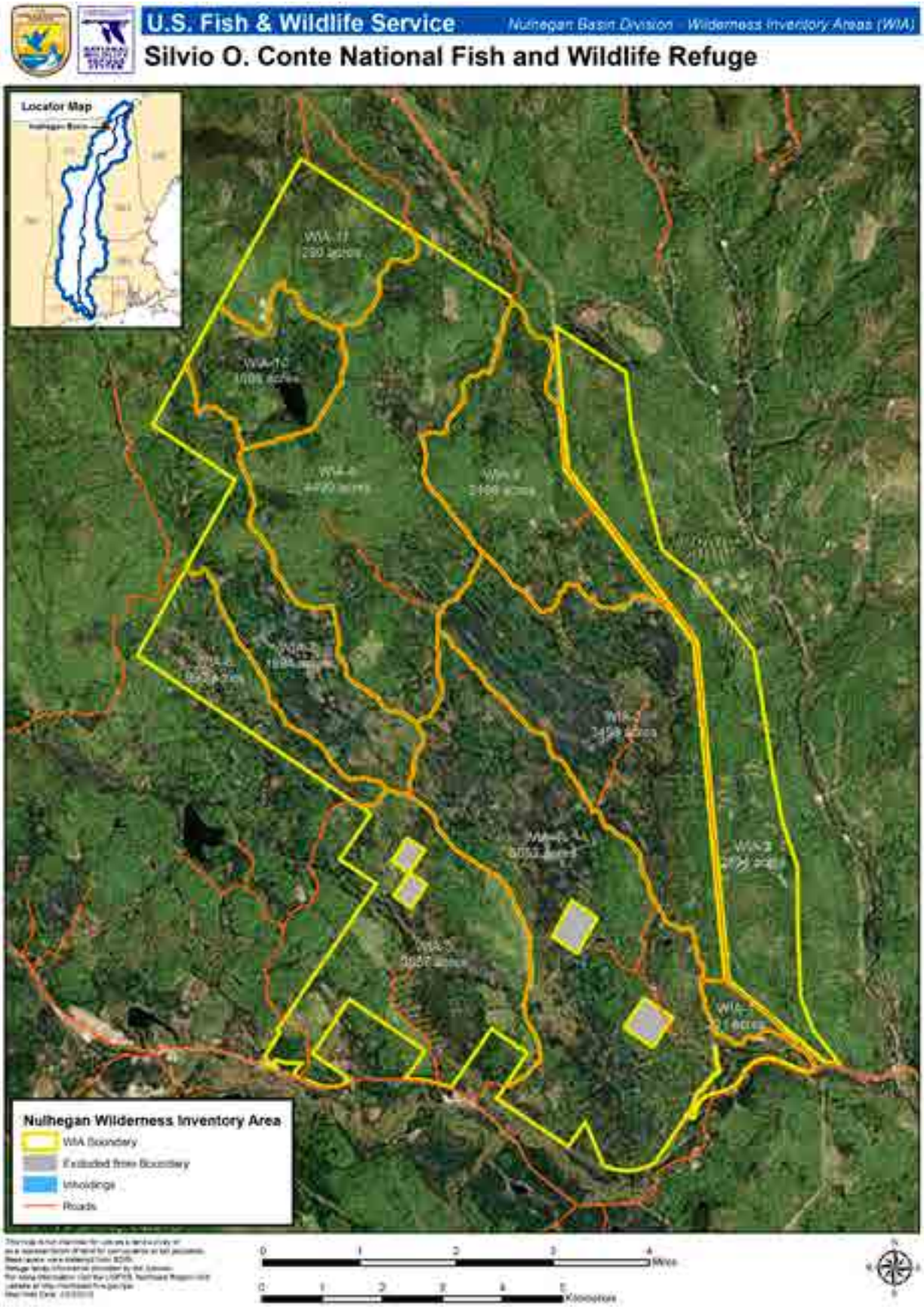
**Table E.3. Silvio O. Conte National Fish and Wildlife Refuge, Nulhegan Basin Division Wilderness Inventory Areas**

| Wilderness Inventory Area (WIA)* | Size** |
|---|---|
| **WIA 1** | 201 acres |
| **WIA 2** | 2,894 acres |
| **WIA 3** | 3,498 acres |
| **WIA 4** | 5,052 acres |
| **WIA 5** | 2,867 acres |
| **WIA 6** | 990 acres |
| **WIA 7** | 1,994 acres |
| **WIA 8** | 4,490 acres |
| **WIA 9** | 2,198 acres |
| **WIA 10** | 1,089 acres |
| **WIA 11** | 1,260 acres |

** All WIAs are in fee title ownership.*

*** Approximate acreage from GIS listed.*

*Map E.2. Wilderness Inventory Areas – Nulhegan Basin Division*



**Features and characteristics common to both WIA 3 and WIA 4:**
*Yellow Bogs*–The Nulhegan Basin contains an area that is commonly referred to as "Yellow Bogs." Although no formal boundary exists for Yellow Bogs, it is generally accepted as an area characterized by fairly level topography with poor drainage supporting a conifer matrix forest, which is a mix of forested swamps and bogs intermingled among lowland and upland spruce-fir-tamarack forests. A portion of land within both WIAs is considered to be a part of the Yellow Bogs. Yellow Bogs contains a diversity of plants, habitats, and wildlife considered of high ecological value. A variety of species present in this ecosystem have been identified as resources of concern on a number of state and regional plans.

*Forest Management*–Throughout both WIAs, previous forest management actions are evident in all but the wettest areas. More than a century of forest management has resulted in a vegetative condition that differs markedly from those shaped through natural processes. On heavily managed uplands, age and structural diversity are lacking. Additionally, approximately 3,125 acres (37 percent) of land within the two units is in a successional stage that supports vegetation different from the prescribed natural community. Though not specific to these WIAs, a Conifer Patch Analysis (Lapin and Engstrom 2002) provides a context for the effects of past forest management to the broader forest community. In analyzing the lowland spruce-fir forest within the division, they found that 82 percent was less than 40 years old. Further, they noted that of the forest patches more than 40 years old, only 14 percent constitute "interior forest", as defined by patches separated from adjacent clearcuts by at least 100 meters. Finally, the authors report that "…it is not a gross overgeneralization to say that every acre of lowland spruce-fir forest in the Refuge is younger than 80 years old."

*Wind Events*–In the wet-mesic matrix forest dominated by conifers, it is common for trees to topple over from wind events. Although more prevalent in the conifer-dominated forest, these "blowdowns" are evident throughout these units and range in size from single trees to much larger areas. Areas that had been selectively harvested appear to have experienced an increase in blowdowns, which can be expected as trees, especially conifers, lose their resilience to such events when adjacent trees are removed.

*Cabins*–There are several cabins along the perimeter of these WIAs. These cabins predate Service acquisition of the land. Cabin owners lease land owned in fee by the Service. A special use permit (SUP) is issued to cabin owners on a 5-year basis, with an understanding that no SUP will extend beyond 2049. In the meantime, cabin owners may choose to sell their remaining interest to the Service. Any structures acquired will be removed if they are of no future use to refuge management needs and the underlying ground will be allowed to revert to its pre-existing vegetative cover.

*Rivers*–River systems flow through both WIAs. Within the State of Vermont, rights, ownership, and management of navigable waters are the sole jurisdiction of the State. These are not eligible for wilderness designation but have not been identified as features restricting the bounds of a WIA.

**Other features and characteristics in WIA 3:**
Acreage: 3,498 acres
Ownership: Fee title

*Habitat*–Yellow Bogs is an area that has no formal demarcation, but is generally considered to encompass the northeastern quarter of the Nulhegan Basin. Much of the Yellow Bogs—including important natural communities commonly known as Big Swamp and Blowdown Bogs—falls within WIA3. WIA3 is one of the most extensive areas of boreal habitat in Vermont: a large complex of black spruce swamps, alder thickets, sedge meadows, and lowland bogs interspersed within lowland spruce-fir forests. Additionally, large expanses of lowland spruce-fir forest are known to support a great number of species (DeGraaf and Yamasaki 2001). Stands with mature trees support bark-gleaning and cavity-nesting species as trees reach senescence, creating snags and live stems with decay columns within the boles. Black-backed woodpecker is typical in these areas. Hardwood inclusions that arise from periodic disturbances to the main canopy support still more species; red-eyed vireo, for example.

Big Swamp represents an extensive and relatively undisturbed example of lowland black spruce forest—an uncommon community type in Vermont. The swamp has a canopy dominated by black spruce, with lesser amounts of tamarack and balsam fir. The shrub layer is sparse—tall shrubs of mountain holly, withe-rod, and red maple are most common. Habitat characteristics within Big Swamp are thought to support the rare black-backed woodpecker, spruce grouse, gray jay, rusty blackbird, bay-breasted warbler, and possibly Wilson's warbler.

Blowdown Bogs is a diverse area, including some black spruce swamps, a lowland bog, and shrub swamp, all within a matrix of lowland spruce-fir forest. The lowland bog is dominated by black spruce in the canopy,

and in the shrub layer bog-cotton, bog laurel, *Rhodora*, and small cranberry. The shrub swamp is a formerly forested area currently recovering from a large blowdown event. This area also serves as an excellent example of paludification—a process whereby a reduction in evapotranspiration from the loss of a forested canopy leads to an increase in the wetness of a site through a "drawing up" of the water table. This process is common in the moist, cool environment of the subarctic, but is extremely rare in Vermont. Blowdown Bogs provides important habitat characteristics for rare boreal birds, and a rare boreal plant—mountain cranberry.

These unique areas within WIA 3 sit within a matrix of lowland spruce-fir forest, with a significant portion having been harvested in the recent past (Lapin and Engstrom 2002). While this matrix forest is not unique per se, it serves as an important buffer to the unique communities discussed above.

*Natural Communities/Naturalness*–Approximately 1,036 acres (30 percent) of land within this unit support vegetation that is significantly different than the natural community of the area in which it occurs. WIA 3 has lands that have been managed intensively for forest products and appear so, and lands that were not managed intensively, if at all, within the past 100 years. We used tree height and canopy closure as indicators of perceived "naturalness", although greater heights and a larger percentage of closure are not necessarily indicative of natural or mature forest conditions. In evaluating the mix of forest conditions, three areas within WIA 3 were identified as having characteristics that could appear as natural to the general public. Collectively these three areas account for approximately 55 percent of WIA 3.

*Roads*–Peanut Dam Road extends approximately 1.3 miles from Stone Dam Road into the unit. This is a gravel road that was constructed by the previous owners for timber extraction, and has been maintained to minimum standards (i.e., passable by vehicles but with no grading, gravel additions, etc.) by the Service since acquisition. In addition, this WIA contains approximately 4.8 miles of "winter" road, consisting of an unimproved cleared alignment used for hauling wood products. While not having been used for more than a decade, these winter roads are still clearly identifiable in recent aerial photographs and may influence a person's perception of "naturalness". It is also likely that many of these roads would be used by the Service to accomplish future habitat management projects.

*Cabins*–Six privately owned cabins are within this unit.

*Gravel Pit*–One site exists where gravel has been extracted, probably for use in building or maintaining roads. The total area of this site is approximately one acre.

**Other features and characteristics in WIA 4:**
Acreage: 5,052 acres
Ownership: Fee title

*Inholdings*–WIA 4 is the largest contiguous parcel of land within the division. The WIA contains two in-holdings that are not owned by the Service and therefore they will not be further studied in this review. Their acreages have not been included in the WIA acreage calculation.

*Habitat*–Upland areas support a mix of conifer and hardwood, as well as hardwood dominant forests in the more southern portions, and especially as the land rises from the Yellow Branch to the eastern and western expanses of the unit. Regeneration is occurring within "skid roads" that were used for timber extraction that occurred prior to Service acquisition. These roads are no longer used for machinery access by the Service, but are still present and easily distinguished.

*Yellow Bogs*–A large portion of the northern and central regions of this unit, as well as wetlands found along the river corridor of the Yellow Branch, are a part of Yellow Bogs. This portion of Yellow Bogs is primarily drained by the Yellow Branch of the Nulhegan River, which has its headwaters to the north on an adjacent WIA, but the majority of which meanders through WIA 4. The portion of the Yellow Branch that is within this unit is considered a navigable waterway, and therefore is owned and managed by the State of Vermont.

*Natural Communities/Naturalness*–Approximately 2,089 acres (41 percent) of land within this unit support vegetation that is significantly different than the natural community of the area in which it occurs. WIA 4 has lands that have been managed intensively for forest products and appear so, and lands that were not managed intensively, if at all, within the past 100 years. We used tree height and canopy closure as indicators of perceived "naturalness", although greater heights and a larger percentage of closure are not necessarily indicative of natural or mature forest conditions. In evaluating the mix of forest conditions, four areas within WIA 4 were

identified as having characteristics that could appear as natural to the general public. Collectively these four areas account for approximately 42 percent of WIA 4.

*Roads*–Black Branch road extends approximately 2.3 miles from Stone Dam Road into the unit. This is a gravel road that was constructed by the previous owners for timber extraction, and has been maintained to minimum standards (i.e., passable by vehicles but with no grading, gravel additions, etc.) by the Service since acquisition. In addition, this WIA contains approximately 4.9 miles of "winter" road, consisting of an unimproved cleared alignment used for hauling wood products. While not having been used for more than a decade, these winter roads are still clearly identifiable in recent aerial photographs and may influence a person's perception of "naturalness". It is also likely that many of these roads would be used by the Service to accomplish future habitat management projects.

*Cabins*–Five privately owned cabins are within this unit.

*Gravel Pits*–Two sites exist where gravel has been extracted for use in building or maintaining roads. The total area of these sites approximates 2.8 acres.

***Wilderness Inventory Conclusion for Nulhegan Basin Division***
The wilderness review team identified eleven WIAs within the approved acquisition boundary of the division and determined that none of the WIAs meet all of the minimum wilderness criteria. However, because of their unique characteristics, WIA 3 and WIA 4 should be further evaluated. WIA 3 and 4 are within the approved acquisition boundary of the division and are owned in fee by the Service.

WIA 3 does not meet the roadless or size criteria but has components that may appear natural to the general public and provides the opportunity for solitude or primitive recreation. Peanut Dam Road is within this WIA and would have to be decommissioned in order to be considered roadless.

WIA 4 does not meet the roadless criterion but does meet the size criterion, has components that may appear natural to the general public, and provides for solitude or primitive recreation. Black Branch Road is within this WIA and would have to be decommissioned in order to be considered roadless.
WIAs 3 and 4 are comprised of undeveloped Federal lands, a portion of which retain their primeval character and influence, without permanent improvements or permanent human habitation. Collectively, they span a significant portion of a conifer matrix forest ecosystem, which possesses high ecological value. Additionally, these WIAs contain an approximately 6-mile common border, divided by a single-lane gravel road subject to a deeded right-of-way. Although the presence of this road precludes a wilderness area from being considered roadless, the juxtaposition of habitat provides a high degree of ecological and wildlife habitat connectivity.

We will evaluate WIA 3 and WIA 4 as WSAs in the wilderness study phase of this wilderness review. In the study phase, we will evaluate a range of management alternatives to determine if WSA 3 or 4 are suited for wilderness designation, or are suited for management under an alternate set of goals and objectives that do not involve wilderness designation.

## 4. Wilderness Study

### *4.1. Nulhegan Basin Division*

WSA 3 and WSA 4 were found to possess wilderness characteristics defined by the Wilderness Act. In the wilderness study, we further evaluate these WSAs to determine their suitability for management, preservation, and designation as wilderness. Considerations in this evaluation included:

- Quality of wilderness values.
- Evaluation of resource values, public uses, and associated management concerns.
- Capability for management as wilderness.

This information provides a basis to compare the impacts of a range of management alternatives and determine the most appropriate management direction for each WSA.

**Evaluation of Wilderness Values**
This section evaluates the quality of the WSAs' mandatory and supplemental wilderness characteristics.

***Roadless:*** Both WSA 3 and WSA 4 contain a combined 13 miles of both gravel and winter roads within their perimeter bounds. These roads were built by previous owners and while the gravel roads have been maintained

by the Service for administrative purposes and public access, the winter roads have not been maintained, yet are still clearly distinguishable in current aerial photography. In order for these WSAs to qualify as roadless, the gravel roads will need to be decommissioned and either removed or allowed to naturally return to a forested condition, while in the absence of active use, the winter roads will continue to re-vegetate over time and may be mostly obscured in the next few decades.

***Naturalness:*** Although sharing a history of extensive logging, both of the WSAs contain discrete areas that provide a sense of naturalness and generally appear to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable. These areas are comprised of predominately forested and non-forested wetlands, which provide an environment with natural character. These wetlands occur in irregular shapes that with one exception are well less than one-mile square. In WSA 3, the wetlands are located in closer proximity to each other and therefore collectively they provide a larger, more expansive area with a natural appearance. The wetlands within WSA 4 are more isolated, creating a less notable natural appearance. The adjoining upland areas present throughout both WSAs have been subject to intensive forest management. In these upland areas, it is obvious that forest manipulation has occurred, thus reducing the naturalness of the corresponding landscape. These areas are regenerating naturally and therefore are now being shaped by natural forces. However, it will take hundreds of years before evidence of human intervention is less apparent.

The majority of the topography has been unaltered, with the exceptions being the gravel pits, skid roads, and a few log landings. The small, isolated cabins and gravel spur roads have been identified as features that impact the sense of naturalness.

***Outstanding Opportunities for Solitude or Primitive Recreation:*** Both WSAs provide opportunities for solitude or primitive recreation. The WSAs are in remote areas that are more than 70 miles from a major airport and more than 20 air-miles from an interstate highway, although the most pristine forest elements generally share a substantial border with gravel roads and/or the 450 kV transmission line corridor. The transmission line, with poles in excess of 80 feet in height, forms the eastern boundary of WSA 3. This transmission line is visible from WSA 3 and, therefore, will likely have some visual impact that may reduce the overall sense of solitude and opportunity for primitive recreation. However, the relatively level topography and dense vegetation will serve to mask its presence.

***Quality of Supplemental Values:*** Both of the WSAs offer excellent ecological values with features of scientific, educational, and scenic interest. The peat lands and forested wetlands have been relatively unaltered by human intervention and therefore offer a unique opportunity to observe or study habitats that have been primarily shaped by natural processes. These areas also contain a variety of plants that are rare in the State of Vermont, including one of the rarest plants in the State, lingonberry (*Vaccinium vitis-idaea*). The Nulhegan Basin is rich in Native American and modern American history, although most is obscured by the dense forest vegetation within the WSAs, with the exception of the more recent forest management activities. The exception to this is the evidence of historic log-drive dams that existed in the Black Branch of the Nulhegan River, within the perimeter of WSA 3. In addition, the results of an ecological assessment of the Nulhegan Basin indicate (Lapin and Engstrom 2002) :

- "The Nulhegan Basin is a landform of a unique large size, geologic history, and natural community mosaic. The forest and wetland vegetation have boreal affinities and the landscape thus may be considered to be one of a handful of large, lowland southern extensions of boreal vegetation types."

- "Conserved areas in Maine and New York are similar to the Nulhegan Basin in several, but not all, ecological parameters (specifically, natural community and floristic composition, soils, and hydrology in various combinations at the different sites). The Maine and New York sites are located approximately 300 miles apart, and the Nulhegan Basin sits practically midway between."

- "The Nulhegan Basin is a landscape of a scale similar to few lowland spruce-fir landscapes in any geologic landform from Maine to New York; thus, it provides one of the few opportunities for landscape-scale, lowland spruce-fir forest conservation in the northeastern United States."

- "The Nulhegan Basin is one of the southernmost lowland spruce-fir landscapes, and thus provides habitat for a variety of northern organisms that are of conservation concern in the region (particularly forest birds and some plants). As such, the area also has implications for providing corridor, stepping stone, or refugium functions with regard to global climate change."

***Evaluation of Manageability and Other Resource Values and Uses:*** Neither of these WSAs can be managed as a wilderness without making some exceptions. Both of the WSAs contain privately owned and maintained recreational cabins on their periphery. These cabins are on leased lots that are owned in fee by the Service, and leased to camp owners - use of the cabins may extend until 2049 at the owner's discretion. While the Service has a standing offer to purchase cabins from willing sellers, it should be assumed for the purposes of this review that the cabins will remain until 2049. Until that date, cabin owners are granted legal use and access of their cabins and an associated one-acre plot of land.
*Rivers*—Rivers flow through both WSAs. The State of Vermont retains rights and ownership of public waters defined as "navigable", and the lands lying thereunder. Although these non-Federal lands are not eligible for wilderness designation, they have not been identified as features that restrict the bounds of a WSA. Although they are assumed to be negligible at the WSA-scale, accurate acreages have not been calculated for the riverine portions of the WSAs, and therefore have not been removed from the WIA or WSA acreage.

*Inholdings*—Two parcels totaling approximately 167 acres are within the perimeter bounds of WSA 4 (map E.2) and have been deducted from the acreage total. These lots are owned in fee by private and municipal interests. The owners of these lands retain certain "unwritten and unrecorded ingress and egress rights." The 84-acre lot falls within the Refuge acquisition boundary; the 83-acre lot does not.

*Deer Wintering Area*—The largest "deer wintering area" in the State of Vermont is within the Nulhegan Basin area. The majority of this historic wintering area is on the division (approximately 10,000 acres) and encompasses all of WSA 4 and most of WSA 3. In this northern region, wintering areas are critical for the survival of white-tailed deer. Furthermore, the multi-aged, dense canopy forest conditions desired for wintering deer benefit additional wildlife species of concern and contribute to broader ecological goals. Past forest management has significantly reduced the amount of functional shelter currently available within this area, disrupting the desired condition. Rehabilitation efforts utilizing mechanized equipment will be necessary to encourage a multi-aged forest that would more quickly develop into and sustain the desired habitat condition for wintering deer and a variety of other wildlife species associated with these habitat conditions.

*American Woodcock*—Woodcock Habitat Management Demonstration Areas exist within both WSA 3 and WSA 4. These areas comprise approximately 134 acres of WSA 3 and 32 acres of WSA 4. These locations have been selected because they contain features that are highly suitable for woodcock habitat management and provide access to exhibit such treatments to potential practitioners. These areas contribute to the Northern Forest Woodcock Initiative (NFWI), of which the Service is a partner. The NFWI is a landscape-level conservation approach that is dependent on private and public involvement. NFWI was developed to address the rapid decline in woodcock populations. The division was identified as one of the most suitable public land areas for woodcock management in Bird Conservation Region 14 (BCR 14). This presents opportunities for the division to contribute to the recovery efforts of the NFWI and to the goals of national plans identifying woodcock as a priority species of concern. One of the goals of the NFWI is to establish woodcock demonstration areas to provide examples of proper woodcock management and to provide research and monitoring opportunities. Creating such demonstration areas on the division also provides the opportunity for public education and interpretation, and thus will further contribute to the Service's goals and the Conte Refuge's purposes. The Service has committed to actively managing these areas for the purposes intended until it is determined they are no longer critical to meet the goals of the NFWI. Employing mechanized equipment that shreds or removes trees will be necessary at five to seven year intervals in order to provide the stages of dense and shrubby early successional habitat required by woodcock to successfully complete their lifecycle. Additional information regarding the locations, goals, objectives, and strategies for each demonstration area may be found in the Woodcock Habitat Management Plan (USFWS 2009).

*Motorized Vehicles*—Most of the perimeter bounds of the WSAs are division roads (and a private powerline road) that are open to the public. These roads are open to motorized vehicles throughout the year, except when the roads are not passable due to muddy conditions which typically occur during April and May. Snowmobiles are the only motorized vehicles allowed during the winter season and are restricted to a network of trails that primarily overlay gravel roads; encompassing approximately 33 of the division's roughly 40 miles of gravel roads. The trails are maintained by the Vermont Association of Snow Travelers (VAST) through a SUP. Each year, the division receives approximately 2,000 wheeled vehicle visits and 8,000-12,000 snowmobile visits, depending on snow conditions. Sound from wheeled vehicles dissipates within a short distance, while the basin's topography tends to project snowmobile sounds. This may adversely affect "wilderness character" during winter and necessitate an evaluation of potential changes to the snowmobile trail network.

*Powerline Corridor*–The eastern boundary of WSA 3 is a privately owned powerline corridor. This corridor is 200 feet in width and is owned and managed by the Vermont Electric Power Company (VELCO). An access road extends the length of the corridor and is open to public travel. Wheeled motorized vehicles and snowmobiles are allowed and the season and mode of use are typically managed similarly with the division. Motorized vehicles on the division, as well as the powerline road, are restricted to registered vehicles that can be legally operated on public highways. All-terrain vehicles (ATV) and other motorized vehicles such as dirt bikes and all-terrain cycles are not permitted on the division or on the powerline road.

**Development of CCP Alternatives**
After evaluating the quality of wilderness values, manageability, and other resource values and uses, and reviewing public comments during the scoping phase, the following action alternatives were developed and analyzed in the accompanying draft CCP/EIS for Conte Refuge:

***Alternative C (Service's Preferred Alternative):*** Under this alternative, neither of the WSAs (0 acres) would be recommended for wilderness designation. Both WSAs would be managed to accomplish habitat management objectives for priority wildlife species as described in the draft CCP/EIS. More specifically, habitat management would follow the actions described in a future Habitat Management Plan. In general, both passive and active management would be used to attain an adequate diversity and distribution of age classes with an emphasis on rehabilitating natural communities and a naturally sustainable multi-aged forest. Once goals have been met in terms of rehabilitating natural communities and age-class distributions, it is recommended that another wilderness review be completed.

The forests in both WSAs have been subject to intensive forest management resulting in predominately even-aged characteristics that lack aspects of the biological diversity and ecological integrity important to Federal trust resources and other species and habitats of conservation concern to the Service. It would take hundreds, if not thousands of years, for a forest to develop naturally the multi-aged, biologically diverse characteristics that contribute to a healthy and sustainable ecosystem. However, research has demonstrated that the thoughtful application of uneven-aged management techniques will encourage multi-aged forests, comprised of native species growing on appropriate natural community sites, to develop at a much faster rate than through sole reliance on natural processes/disturbances (Schütz 2002, Seymour et al. 2002, Keeton 2004, Franklin et al. 2005). Therefore, the wilderness review team concluded at this time that the potential use of active management in both WSAs is critical to achieving habitat goals and objectives in a timely manner. Furthermore, the team concludes that once conditions that lend themselves well to natural sustainability have been restored, another wilderness review should be conducted. It is likely that the beginning stages of naturally sustainable forest conditions could occur within the next 30 to 50 years.

***Alternative D (Propose Unit 3 and Unit 4 as Wilderness with Exceptions):*** Under this alternative, both WSA 3 and WSA 4 would be recommended for wilderness designation with exceptions that include cabin SUPs, access rights to private landowners, and decommissioning and reforestation of interior roads and gravel pits. Additionally, waterways that are owned by the State of Vermont are not eligible for wilderness designation and therefore are not included under this alternative.

The recreational cabin program would be administered consistent with current practices (i.e., use and maintenance of cabins would continue as prescribed in the existing SUP, and SUPs would not be renewed beyond 2049). When feasible, lands and cabins within the WSAs would be purchased from willing sellers. Once cabins were acquired by the Service, they would be dismantled and removed, and the site would be restored to a natural condition.

Access rights to landowners, both interior and adjacent to the division, as well as cabin owners would continue to be allowed as specified in any and all legal documents, and more specifically, in accordance with the deeds that are held by adjacent landowners wherein roadway rights-of-way are considered at a width of 66 feet.

Roads that currently exist as spur roads into the WSAs, namely Peanut Dam Road and Black Branch Road, which have been maintained for administrative and public access purposes, would be decommissioned and the use of machinery and other mechanized equipment would be used, if warranted, to restore road beds to conditions that facilitate natural hydrologic flows or other natural conditions, as advised through future environmental assessments. Gravel pits that lie within the WSAs would also be subject to the use of machinery and other mechanized equipment for restoration and habitat rehabilitation purposes.

The WSA boundaries would be defined by the gravel roads that surround the WSAs, namely Lewis Pond, Eagle's Nest, Canal, Stone Dam, and Tin Shack Roads, and all private lands and rights-of-way. The width of the gravel roads is considered 66 feet as defined by the deeds held by adjacent landowners.

Because Congress has reserved the authority to make final decisions on wilderness designation, the wilderness recommendations are preliminary administrative determinations that will receive further review and possible modification by the Service Director, the Secretary of the Interior, or the President. However, the analysis of the environmental consequences of this alternative in chapter 5 of the draft CCP/EIS is based on the assumption that Congress would accept the recommendation and designate both WSAs as wilderness.

If both WSAs are designated as wilderness, they would be managed according to the provisions of the Wilderness Act and Service wilderness management regulations (50 CFR 35) and wilderness management policy in the Refuge Manual (6 RM 8). The areas would be managed to accomplish refuge purposes and the NWRS mission, while also preserving wilderness character and natural values for future generations. Use of motorized vehicles, motorized equipment, and mechanical transport may be allowed for emergency purposes and when necessary to meet minimum requirements for the administration of the area as wilderness and to accomplish refuge purposes. Proposed or new Nulhegan Basin Division management activities, or division uses would be evaluated through a minimum requirements analysis and NEPA compliance to assess potential impacts and identify mitigating measures to protect wilderness character.

### 5. Alternatives Considered but Eliminated from Consideration

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). It was determined that there was no benefit in analyzing partial wilderness alternatives for individual WSAs. There are no feasible or practical boundary adjustments that would improve the manageability of an individual WSA. Additionally, it is not feasible to recommend wilderness without providing exceptions for cabin usage and deeded rights-of-way.

## Conte Refuge Wilderness Review Team

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Appendix F

Sharon Lindsay

*Nulhegan River adjacent to nature trail*

# Wild and Scenic Rivers Review

- Introduction
- National Wild and Scenic Rivers System
- Existing and Proposed WSRs in the Connecticut River Watershed

## Introduction

The Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge) Act of 1991 authorized the creation of the Conte Refuge. The legislated project boundary includes the entire 7.2 million-acre Connecticut River watershed. Over 1.8 million acres within the watershed currently have some form of permanent protection. This conserved lands network includes the Conte Refuge footprint (as of October 7, 2013, totaling 35,989 acres—all owned in fee title with the exception of approximately 170 acres in conservation easements) and tracts owned by State and local governments, local and national non-governmental organizations, and other Federal agencies.

The draft Conte Comprehensive Conservation Plan (CCP) is based on a landscape-scale, partnership approach to conservation within the Connecticut River watershed. Because of the geographic scope and scale of the refuge's legislative project boundary and the limited staff and other refuge resources available, the management alternatives in the draft CCP focus on two tiers of priority areas of interest to the U.S. Fish and Wildlife Service (Service, FWS) within the Connecticut River watershed.

- Conservation Partnership Areas (CPAs) are areas within the watershed where we propose refuge staff use their resources to facilitate and support the conservation, education, and recreation work led by others on other ownerships.

- Conservation Focus Areas (CFAs) are areas of particularly high importance and significance to the Service, and typically nested within CPAs, where we propose refuge staff take the lead role in conservation, education, and recreation actions. Any future land acquisition for the refuge would be focused in CFAs.

Congress created the National Wild and Scenic Rivers System (National System) in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The National Wild and Scenic Rivers System Act directs Federal agencies to consider potential wild and scenic rivers in their land and resource planning processes. Wild and scenic river considerations are a required element of CCPs and conducted in accordance with the refuge planning process outlined in 602 FW 1 and 3, including public involvement and National Environmental Policy Act compliance.

This report documents the Service's preliminary inventory and eligibility assessment of rivers and streams that flow through all CPAs evaluated in the draft CCP, and all rivers and streams within existing refuge units not embedded within a CPA.

At the present time, we are not pursuing further study of any of the rivers and streams catalogued in this inventory. Wild and Scenic River (WSR) Studies for rivers and streams in the Connecticut River watershed and Conte Refuge should be conducted with full participation and involvement of our Federal, state, local, and nongovernmental partners.

Some of these river segments are currently being evaluated by other entities for their potential to be designated Federal wild and scenic rivers. For example, the Wild and Scenic Westfield River Committee is currently working with volunteers and community members to assess potentially extending the Westfield River's designation to include several other tributaries, including the Dead Branch.

## National Wild and Scenic Rivers System

The National System was established by Congress in 1968 to protect certain outstanding rivers from the harmful effects of new Federal projects such as dams and hydroelectric facilities. Section 1(b) of the Wild and Scenic Rivers Act states:

*It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.*

The National System includes a spectrum of rivers, from cascading mountain streams to rivers meandering through valleys, from remote wilderness to rural and urban rivers. Rivers and river segments are classified, designated, and administered in one of three categories depending on the extent of development and accessibility along each section.

- Wild Rivers—Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

- Scenic Rivers—Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

- Recreational Rivers—Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

The original Act designated eight rivers as components of the National System, and specified processes by which other rivers could be added. Since 1968, the Act has been amended many times, primarily to designate additional rivers and to authorize the study of other rivers for possible inclusion in the National System. As of July 2012, the National System protects 12,598 miles of 203 rivers in 39 states and Puerto Rico.

***Provisions for Expanding the National System***

Congress included mechanisms and standards in the WSR Act to provide for the expansion of the National System. Rivers may be designated by Congress (under Section 3(a) of the Act) or, if certain requirements are met, the Secretary of the Interior (under Section 2(a)(ii) of the Act).

Rivers included in the National System by act of Congress are administered by one of four Federal agencies: Bureau of Land Management (BLM), National Park Service (NPS), U.S. Forest Service (USFS), and/or the Service as specified in the legislation. Management is provided by the Federal agency (or agencies) that have jurisdiction over the federals lands adjacent to the river. The Federal WSR-administering agency is responsible for implementing the Act's requirements through its authorities on federal lands and through voluntary, cooperative strategies developed with other governments, Tribal nations and landowners on non-Federal lands.

Congressionally designated rivers that flow entirely or largely through non-Federal lands require a community-based conservation approach. This collaborative approach is well-evidenced on "Partnership" rivers in the National System. The designated rivers are administered by the NPS but a local partnership organization (e.g. a watershed association, river council or advisory committee representing landowners, and local and state governments) is responsible for day-to-day management. NPS staff assist communities in managing their river-related resources locally by bringing together state, county, and community representatives to preserve the values for which the rivers were designated.

Section 2(a)(ii) authorizes the Secretary of the Interior to include in the National System a river already protected by a state river protection program (i.e., by act of a state's legislature) upon application by a state's governor. Applications by the states are evaluated and processed by the NPS. If found eligible, and sufficient protection is afforded by the state, the Secretary may designate the river. Rivers designated in this manner are administered by the state (sometimes with assistance from local governments), except for any Federal lands along the river. If there are federal lands located along the river, the state and federal river-administering agencies may enter into an agreement to outline federal/state management roles and responsibilities and/or provide for management and protection of river values.

***Designation Criteria and Study Process***

Before a river can be added to the National System through congressional designation, it must be both eligible and suitable for designation.

To be eligible, the river must be free-flowing and possess at least one river-related "outstandingly remarkable" resource value (ORV), such as high quality scenery, recreational opportunities, geologic features, fisheries and wildlife, historic sites or cultural resources. In order to be assessed as outstandingly remarkable, a river-related value must be a unique, rare, or exemplary feature that is exceptional at a comparative regional or national scale. A variety of methods can be used to determine whether certain river-related values are so unique, rare, or exemplary as to make them outstandingly remarkable. The determination that a river area contains outstanding values is a professional judgment on the part of an interdisciplinary study team, based on objective analysis. The ORV eligibility criteria listed in table F.1 describe the minimum thresholds for evaluating river-related values. These criteria are not all-inclusive and may be modified by the study team.

**Table F.1. Eligibility Criteria for Outstandingly Remarkable Values**

| |
|---|
| **Scenery:** The landscape elements of landform, vegetation, water, color and related factors result in notable or exemplary visual features and/or attractions. Scenery and visual attractions may be highly diverse over the majority of the river or river segment. |
| **Recreation:** Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region.<br>• Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.<br>• The river may provide, or have the potential to provide, settings for national or regional usage or competitive events. |
| **Geology:** The river or the area within the river corridor contains one or more example of a geologic feature, process or phenomenon that is unique or rare within the region of comparison. |
| **Fish:** Fish values may be judged on the relative merits of fish populations, habitat, or a combination of these river-related conditions.<br>• Populations: The river is nationally or regionally an important producer of resident and/or anadromous fish species. Of particular significance is the presence of wild stocks and/or federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."<br>• Habitat: The river provides exceptionally high quality habitat for fish species indigenous to the region of comparison. Of particular significance is habitat for wild stocks and/or federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of habitats is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable." |
| **Wildlife:** Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations or habitat or a combination of these conditions.<br>• Populations: The river, or area within the river corridor, contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique, and/or populations of federal or state listed (or candidate) threatened endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."<br>• Habitat: The river, or area within the river corridor, provides exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat or a critical link in habitat conditions for federal or state listed (or candidate) threatened, endangered or sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable." |
| **Prehistory:** The river, or area within the river corridor, contains a site(s) where there is evidence of occupation or use by Native Americans. Sites must have unique or rare characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; and/or may have been used by cultural groups for rare sacred purposes. Many such sites are listed on the National Register of Historic Places, which is administered by the NPS. |
| **History:** The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or one-of-a-kind in the region. Many such sites are listed on the National Register of Historic Places. A historic site(s) and/or features(s) is 50 years old or older in most cases. |
| **Other Values:** While no specific national evaluation guidelines have been developed for the "other similar values" category, assessments of additional river-related values consistent with the foregoing guidance may be developed–including, but not limited to, hydrology, paleontology and botany resources. |

Rivers that are found eligible are then assigned a tentative classification as either "wild," "scenic," or "recreational" depending on the amount of development and human presence along the river. Determining whether a river is "suitable" for designation is more complicated than the relatively straightforward resource assessment required to evaluate eligibility. Essentially, suitability is an evaluation of:

- First, whether the importance of protecting natural, cultural, and recreational resource values outweighs other potential uses of the river.
- Second, whether National Wild and Scenic designation is the most appropriate strategy for long-term protection of the river.

- Third, demonstrated commitment to protect the river by any non-Federal entities who may be partially responsible for implementing protective management.

In other words, does National Wild and Scenic River designation make sense for the river in question? Local residents, leaders, and organizations must show strong support of their intent to participate in the long-term protection of the river.

River studies are conducted pursuant to Section 5(a), through which Congress legislatively directs the study of select rivers, or Section 5(d)(1), which directs federal agencies to identify potential additions to the National System through Federal agency land or resource management planning processes. In both cases, the appropriate Secretary (Interior or Agriculture), is responsible for conducting the river study. Typically, the lead Federal agency is the agency that manages the federal lands adjacent to the study river.

For "private lands" study rivers that that flow entirely or largely through non-Federal lands, NPS staff work with representatives of state and local governments, river conservation groups, and other concerned constituencies to form an advisory committee to guide the study process, determine whether the river meets the designation criteria, and develop a conservation plan to protect the river's free-flowing character and significant resources. Partnership-river study plans often rely on state and local land use requirements and non-Federal land acquisition to achieve their goals.

The final report and recommendation are forwarded to Congress by the President. The river study is typically accompanied by an environmental document, normally an environmental impact statement (EIS), which describes the ORVs and identifies significant issues, public concerns, tentative boundaries and classifications, alternatives and impacts, and appropriate protective management prescriptions and mitigation measures. Congress then decides whether to pass a law adding the river to the National System.

For state-nominated Section 2(a)(ii) rivers, NPS prepares a report determining whether the candidate river meets the requirements of Section 2(a)(ii). Its contents differ from those of study reports prepared under Section 5 of the Act in that the 2(a)(ii) report only addresses the river's eligibility for designation. The report does not address suitability, beyond the requirement that the river be protected pursuant to an act of the state legislature and be administered by a state or local entity. This report is submitted to the Secretary of the Interior, who then decides whether to designate the river as a component of the National System.

### *Protection and Management*

Each river in the National System is administered with the goal of protecting and enhancing the values for which it was designated. Designation neither prohibits development nor gives the Federal government control over private property. Recreation, agricultural practices, residential development, and other uses may continue. Protection of the river is provided through voluntary stewardship by landowners and river users and through regulation and programs of Federal, state, local, or Tribal governments. In most cases, not all land within the designated river corridor boundary is, or will be, publicly owned, and the Act limits how much land the Federal government is allowed to acquire from willing sellers. Visitors to these rivers are cautioned to be aware of and respect private property rights.

The Act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection for some of the country's most outstanding free-flowing rivers. To accomplish this, it prohibits federal support for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or outstanding resource values. However, designation does not affect existing water rights or the existing jurisdiction of states and the Federal government over waters as determined by established principles of law.

## Existing and Proposed WSRs in the Connecticut River Watershed

### *National Wild and Scenic Rivers in the Connecticut River Watershed*

Three rivers within the Connecticut River watershed, the Eightmile River, Farmington River, and Westfield River, have been designated and included in the National System (Table F.2). All three of these rivers are Partnership WSRs that flow entirely or primarily through private lands and are preserved and managed through a partnership of adjacent communities, state governments and the NPS.

All three of the designated rivers flow through Service CPAs evaluated in the draft Conte Refuge CCP/EIS. However, there are no designated segments flowing through Service-owned refuge lands.

Table F.2. Existing Wild and Scenic River Designations in the Connecticut River Watershed.

| River Name | Administering Agencies | Miles by Classification | | | Total Miles |
|---|---|---|---|---|---|
| | | Wild | Scenic | Recreational | |
| **Eightmile, CT** (P.L. 110-229, May 8, 2008 | NPS and Local Government | | 25.3 | | 25.3 |
| **Farmington, West Branch, CT and MA** (P.L. 103-313, Aug. 26, 1994) | NPS, State of CT, and Local Government | | | 14.0 | 14.0 |
| **Westfield, MA** (Secretary of Interior Designation, Nov. 2, 1993) (Secretary of Interior Designation, Oct. 29, 2004) | State of MA | 2.6 | 42.9 | 32.6 | 78.1 |
| TOTAL | | | | | 117.4 |

***Lower Farmington River and Salmon Brook WSR Study***

The upper 14 miles of the Farmington River in Connecticut were designated a Wild and Scenic River in 1994. The passing years proved this designation a success in facilitating river protection and in the Fall of 2003, the Farmington River Watershed Association began to pursue congressional authorization for a WSR study for the lower Farmington River and Salmon Brook. Congress passed P.L. 109-370 authorizing the study on November 27, 2006.

The lower Farmington River and Salmon Brook Wild and Scenic River Study Report and Environmental Assessment were completed in November 2011. The Study Report concludes that approximately 37 miles of the lower Farmington River and 26.4 miles of the Salmon Brook are eligible and suitable for designation. The lower Farmington River and Salmon Brook segments recommended in the Study Report flow through the Farmington River CPA. The Study Report package has been transmitted to Washington, D.C. for congressional action. For more information see *http://www.lowerfarmingtonriver.org/*(accessed August 2017).

**Methodology and Findings**

We used United States Geological Survey (USGS) 7.5 minute topographic maps to identify all named rivers and streams within the 17 CPAs and 21 CFAs evaluated in alternatives C and D. We identified a total of 222 rivers and streams that flow within or through CPAs (table F.3):

- 58 in Connecticut.
- 34 in Massachusetts.
- 58 in Vermont.
- 56 in New Hampshire.
- 16 segments of the Connecticut River main stem.

We calculated the total miles of each river on existing Service-owned refuge tracts, within CPAs, and within CFAs (table F.3).

Potential river-related values (scenery, recreation, geology, fish, wildlife, prehistory, history, and other values) were identified based on existing resource information compiled for the draft Conte Refuge CCP/EIS, CPAs and CFAs, individual refuge divisions and units, and information in the Nationwide Rivers Inventory[1]. For many rivers and stream segments, no information is available. In particular, it was difficult to assess whether each

[1] The NRI is a listing of some free-flowing rivers (or river segments), which, based on preliminary studies, are considered to meet eligibility criteria for the National System. From 1976 to 1980, the Bureau of Outdoor Recreation and the Heritage, Conservation, and Recreation Service compiled the initial NRI, which was subsequently updated, published, and first distributed by the NPS in January 1982. The NRI has not been significantly updated since that time. Listing on the NRI, or any other source list, does not represent an official determination of eligibility, and conversely, absence does not indicate a river's ineligibility. Information about use of the NRI is found at: *www.nps.gov/ncrc/programs/rtca/nri/* (accessed August 2014).

segment was free-flowing or not. The river-related values identified in table F.3 are a preliminary assessment and do not represent an official determination of the presence or absence of ORVs. In this table, we only list the ORVs for rivers that are already designated as Federal Wild, Scenic, or Recreational River or for rivers that are included on the National River Inventory.

**Table F.3. River Segments in Proposed CPA and a Description of Their Wild and Scenic Values.**

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| **Vermont** | | | | | | | | | | |
| Nulhegan | Yellow Branch | 8.0 | 8.0 | 8.0 | 8.0 | 0 | 0 | 0 | 0 | |
| *Nulhegan* | *North Branch -Connecticut River to headwaters North Branch* | *20.0* | *5.0* | *7.7* | *6.2* | *20.0* | *5.0* | *0* | *0* | *Cultural-Major portion of corridor was an old Indian water route between St. Lawrence Valley and the Connecticut River Valley.*<br>*Wild-Corridor and watershed are essentially undeveloped. Over half of segment is extremely inaccessible.* |
| *Nulhegan* | *East Branch - Nulhegan River to near Little Averill Lake* | *12.0* | *0.0* | *12.0* | *0.0* | *12.0* | *12.0* | *0* | *0* | *Cultural-Major portion of corridor was an old Indian water route between St. Lawrence Valley and the Connecticut River Valley.*<br>*Wild-Corridor and watershed are essentially undeveloped. Over half of segment is extremely inaccessible.* |
| Nulhegan | Nulhegan River | 17.5 | 3.2 | 17.4 | 5.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Black Branch | 13.2 | 9.0 | 13.2 | 9.8 | 0 | 0 | 0 | 0 | |
| Nulhegan | Tim Carroll Brook | 2.8 | 1.5 | 2.8 | 1.5 | 0 | 0 | 0 | 0 | |
| Nulhegan | Logger Branch | 4.9 | 4.9 | 4.9 | 4.9 | 0 | 0 | 0 | 0 | |
| Nulhegan | Paul John Brook | 4.0 | 0.0 | 4.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Murphy Brook | 4.7 | 0.0 | 4.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Bailey Brook | 3.5 | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Lightning Brook | 3.9 | 0.0 | 1.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Taffield Willey Brook | 2.1 | 0.0 | 2.1 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Clay Hill Brook | 1.8 | 0.0 | 1.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Mill Brook | 2.6 | 0.0 | 2.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Nulhegan | Fisher Brook | 2.3 | 0.0 | 2.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Ottauquechee | Dimick Brook | 0.8 | 0.0 | 0.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Ottauquechee | Dailey Hollow | 5.0 | 0.0 | 5.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Ottauquechee | North Branch Ottauquechee River | 8.8 | 0.0 | 8.8 | 8.8 | 0 | 0 | 0 | 0 | |
| Ottauquechee | Bridgewater Hollow | 1.8 | 0.0 | 1.8 | 1.8 | 0 | 0 | 0 | 0 | |
| Ompompanoosuc | Ompompanoosuc River | 22.1 | 0.0 | 18.7 | 3.7 | 0 | 0 | 0 | 0 | |
| Ompompanoosuc | West Branch Ompompanoosuc River | 16.8 | 0.0 | 16.8 | 0.0 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| Ompompanoosuc | Lord Brook | 4.2 | 0.0 | 4.2 | 0.0 | 0 | | 0 | 0 | |
| Ompompanoosuc | Abbott Brook | 3.9 | 0.0 | 3.9 | 0.0 | 0 | | 0 | 0 | |
| Ompompanoosuc | Old City Brook | 5.6 | 0.0 | 5.6 | 0.0 | 0 | | 0 | 0 | |
| Ompompanoosuc | Middle Brook | 7.1 | 0.0 | 7.1 | 5.3 | 0 | | 0 | 0 | |
| Ompompanoosuc | Blood Brook | 3.7 | 0.0 | 3.7 | 3.1 | 0 | | 0 | 0 | |
| Ompompanoosuc | Big Brook | 1.2 | 0.0 | 1.2 | 0.0 | 0 | | 0 | 0 | |
| Ompompanoosuc | Glen Falls Brook | 0.9 | 0.0 | 0.9 | 0.0 | 0 | | 0 | 0 | |
| Ompompanoosuc | Roaring Brook | 1.4 | 0.0 | 1.4 | 0.0 | 0 | | 0 | 0 | |
| *West River* | *West River - Route 100 to headwaters* | *12.2* | *0.0* | *3.2* | *0.0* | *2.0* | | *0* | *0* | *Scenic-Headwaters section undeveloped, very scenic.*<br>*(Note: migratory fish, adult Atlantic salmon, sea lamprey)* |
| *West River* | *West River - Ball Mountain to headwaters* | *22.0* | *0.0* | *5.9* | *2.4* | *22* | | *0* | *0* | *Scenic-Unique and diverse juxtaposition and combination of land, water and vegetation elements.*<br>*Recreation-Highly used and regionally unique river segment which includes sections of class IV gradient.*<br>*(Note: migratory fish, adult Atlantic salmon, sea lamprey)* |
| *West River* | *West River - West Townshend to Ball Mountain* | *8.0* | *0.0* | *8.0* | *8.0* | *8* | *8.0* | *0* | *0* | *Scenic-A unique density and diversity of spatial enclosures, topographic features, hydrologic and vegetative elements, including a series of waterfalls, pools, and potholes.*<br>*Recreation-Highly used and regionally unique river segment which includes sections of class IV gradient.*<br>*(Note: migratory fish, adult Atlantic salmon, sea lamprey)* |
| *West River CPA* | *West River - Williamson Station to Townshend Dam* | *11.0* | *0.0* | *11.0* | *1.9* | *11.0* | *11.0* | *0* | *0* | *Scenic-A unique and diverse range of views related to a variety of spatial enclosures, topographic diversity, and land uses,*<br>*Recreation-Highly used river segment possessing a diversity of experiences and easy access.*<br>*Geologic-Three state significant geologic features within or adjacent to the corridor.*<br>*(Note: Migratory fish, adult Atlantic salmon, sea lamprey)* |
| West River | Tannery Brook | 3.8 | 0.0 | 3.8 | 0.0 | 0 | 0 | 0 | 0 | |
| West River | Smith Brook | 4.1 | 0.0 | 2.2 | 1.9 | 0 | 0 | 0 | 0 | |
| West River | Mill Brook | 5.8 | 0.0 | 5.8 | 0.0 | 0 | 0 | 0 | 0 | |
| West River | Fair Brook | 3.1 | 0.0 | 3.1 | 3.1 | 0 | 0 | 0 | 0 | |
| West River | Wardsboro Brook | 7.8 | 0.0 | 5.4 | 2.4 | 0 | 0 | 0 | 0 | |
| West River | Simpson Brook | 1.6 | 0.0 | 1.6 | 1.6 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| West River | Negro Brook | 1.6 | 0.0 | 1.6 | 1.6 | 0 | 0 | 0 | 0 | |
| West River | Ranney Brook | 1.1 | 0.0 | 1.1 | 0.0 | 0 | 0 | 0 | 0 | |
| West River | Turkey Mill Brook | 6.5 | 0.0 | 6.5 | 6.5 | 0 | 0 | 0 | 0 | |
| West River | Little Turkey Mill Brook | 2.3 | 0.0 | 2.3 | 2.3 | 0 | 0 | 0 | 0 | |
| West River | Cobb Brook | 4.7 | 0.0 | 4.7 | 4.7 | 0 | 0 | 0 | 0 | |
| West River | Burnt Meadow Brook | 1.3 | 0.0 | 1.3 | 1.3 | 0 | 0 | 0 | 0 | |
| West River | Flood Brook | 5.3 | 0.0 | 5.3 | 0.0 | 0 | 0 | 0 | 0 | |
| West River | Styles Brook | 2.4 | 0.0 | 2.4 | 0.0 | 0 | 0 | 0 | 0 | |
| West River | Farnum Brook | 1.9 | 0.0 | 1.9 | 0.0 | 0 | 0 | 0 | 0 | |
| *White River* | *White River - Hartford to South Royalton* | *18.9* | *0.0* | *0.0* | *0.0* | *15.0* | *0* | *0* | *0* | *Recreation-A unique diversity of natural and cultural features including Class III gradient, an old Indian travel route, a high number of islands, and a diversity of culturally significant land uses.*<br>*(Note: Migratory fish, adult Atlantic salmon)* |
| *White River* | *White River - South Royalton to headwaters* | *37.0* | *0.0* | *10.1* | *0.0* | *37* | *10.1* | *0* | *0* | *Fish-Includes one of seven regional federal fish hatcheries. All segments are either currently being restored as Atlantic Salmon rivers or were historically such.*<br>*Scenic-A high range and diversity of views due to open low mountain topography, land use diversity and vegetation.*<br>*Historic-A variety of regionally significant historic and cultural features are present in the segment including an old Indian water route, bee-hive dwellings, and an old talc mill site.*<br>*(Note: 9.4 miles of White River within the CPA, migratory fish, adult Atlantic salmon).* |
| *White River* | *White River, First Branch - Confluence with White River to headwaters* | *21.0* | *0.0* | *0.0* | *0.0* | *21* | *0* | *0* | *0* | *Fish-Includes one of seven regional federal fish hatcheries. All segments are either currently being restored as Atlantic Salmon rivers or were historically such.*<br>*Scenic-A high range and diversity of views due to open low mountain topography, land use diversity and vegetation.*<br>*Historic-A variety of regionally significant historic and cultural features are present in the segment including an old Indian water route, bee-hive dwellings, and an old talc mill site.*<br>*(Note: Migratory fish, adult Atlantic salmon)* |
| White River | West Branch Tweed River | 4.7 | 0.0 | 4.7 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Townsend Brook | 3.4 | 0.0 | 3.4 | 0.0 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| White River | South Branch Tweed River | 3.8 | 0.0 | 3.8 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Fletcher Brook | 4.1 | 0.0 | 4.1 | 4.1 | 0 | 0 | 0 | 0 | |
| White River | Story Brook | 8.8 | 0.0 | 8.8 | 5.6 | 0 | 0 | 0 | 0 | |
| White River | Locust Creek | 11.7 | 0.0 | 11.5 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Cleveland Brook | 3.9 | 0.0 | 3.9 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Lillieville Brook | 4.7 | 0.0 | 4.7 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Bridgewater Hollow | 1.80 | 0 | 1.8 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Dimick Brook | 0.7 | 0 | 0.7 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | Dailey Hollow Brook | 4.6 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | |
| White River | North Branch Ottauquechee River | 7.9 | 0 | 7.9 | 0.0 | 0 | 0 | 0 | 0 | |
| **New Hampshire** | | | | | | | | | | |
| *Ashuelot* | *Ashuelot - Shaws Corner to Marlow* | *11.8* | *0.0* | *11.8* | *8.0* | *8* | | *0* | *0* | *Recreation-Segment includes one of longest continuous series of Class III and Class IV rapids, including a gorge at Gilsum, in the southern part of this section.*<br>*Fish-Stream is a regionally significant trout stream supporting native species.*<br>*Cultural-Segment includes a unique stone arch bridge.* |
| *Ashuelot* | *Ashuelot - Confluence with the CT River in Hinsdale to Butterfield Pond in Washington* | *64.0* | *0.0* | *26.4* | *14.3* | *64* | | *0* | *0* | *Recreational-Segment contains 4 miles of continuous Class II-III rapids between Gilsum Gorge and Surry, and an area of Class V rapids south of Winchester.*<br>*Geologic-Gilsum Gorge, a significant natural feature, contains numerous waterfalls and potholes.*<br>*Wildlife-One of only three rivers in NH to support the federally endangered dwarf wedge mussel.*<br>*Historic-Gilsum Stone Arch Bridge and Sawyer's Crossing Covered Bridge are listed in the National Register of Historic Places.*<br>*(Note: This river supports American eel and dwarf wedgemussel).* |
| Ashuelot | Thompson Brook | 4.1 | 0.0 | 3.8 | 0.2 | 0 | 0 | 0 | 0 | |
| Ashuelot | Cannon Brook | 1.8 | 0.0 | 1.8 | 1.8 | 0 | 0 | 0 | 0 | |
| Ashuelot | Hayward Brook | 3.8 | 0.0 | 3.8 | 2.8 | 0 | 0 | 0 | 0 | |
| Ashuelot | White Brook | 2.1 | 0.0 | 2.1 | 0.0 | 0 | 0 | 0 | 0 | |
| Ashuelot | Whittemore Brook | 2.7 | 0.0 | 2.7 | 2.3 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| Ashuelot | Grassy Brook | 5.5 | 0.0 | 5.5 | 3.7 | 0 | 0 | 0 | 0 | |
| Ashuelot | Abbott Brook | 4.1 | 0.0 | 4.1 | 0.0 | 0 | 0 | 0 | 0 | |
| Ashuelot | Barney Brook | 2.0 | 0.0 | 2.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Ashuelot | Richardson Brook | 3.0 | 0.0 | 3.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Ashuelot | Cherry Brook | 2.8 | 0.0 | 2.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Mascoma River | 30.3 | 0.0 | 12.0 | 4.1 | 0 | 0 | 0 | 0 | |
| Mascoma | Indian River | 12.4 | 0.0 | 12.4 | 1.4 | 0 | 0 | 0 | 0 | |
| Mascoma | Moose Brook | 3.5 | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Gulf Brook | 2.8 | 0.0 | 2.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Haines Brook | 2.4 | 0.0 | 2.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Orange Brook | 5.1 | 0.0 | 5.1 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Straw Brook | 3.6 | 0.0 | 3.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Marshall Brook | 2.5 | 0.0 | 2.5 | 2.4 | 0 | 0 | 0 | 0 | |
| Mascoma | Pressey Brook | 2.3 | 0.0 | 2.3 | 2.2 | 0 | 0 | 0 | 0 | |
| Mascoma | Call Brook | 2.5 | 0.0 | 2.5 | 2.5 | 0 | 0 | 0 | 0 | |
| Mascoma | Indian Pond Brook | 3.8 | 0.0 | 3.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Bean Brook | 5.3 | 0.0 | 5.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Grant Brook | 7.7 | 0.0 | 7.8 | 4.1 | 0 | 0 | 0 | 0 | |
| Mascoma | Perkins Brook | 1.6 | 0.0 | 1.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Meadow Brook | 1.7 | 0.0 | 1.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Clough Brook | 2.2 | 0.0 | 2.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Mascoma | Black Brook | 2.8 | 0.0 | 2.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Johns River | 14.1 | 2.8 | 14.1 | 4.7 | 0 | 0 | 0 | 0 | |
| Pondicherry | Stanley (Slide) Brook | 2.1 | 0.3 | 2.1 | 1.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Ayling Brook | 2.1 | 0.8 | 2.1 | 1.6 | 0 | 0 | 0 | 0 | |
| Pondicherry | Stag Hollow Brook | 7.1 | 0.0 | 7.1 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Israel River | 21.2 | 0.0 | 8.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | South Branch Israel River | 5.4 | 0.0 | 5.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Red Brook | 3.4 | 0.0 | 3.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Appleby Brook | 2.7 | 0.0 | 2.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Cherry Mill Brook | 21.0 | 0.0 | 7.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | The Mystic | 1.2 | 0.0 | 1.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Bear Brook | 2.7 | 0.0 | 2.7 | 0.2 | 0 | 0 | 0 | 0 | |
| Pondicherry | Carroll Stream | 4.8 | 0.0 | 4.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Carter Brook | 2.6 | 0.0 | 2.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Cherry Mountan Brook | 2.5 | 0.0 | 2.5 | 0.0 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| Pondicherry | Bog Brook | 7.6 | 0.0 | 7.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Pondicherry | Chase Brook | 3.5 | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Blueberry Swamp | Simms Stream | 9.6 | 0.0 | 9.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Blueberry Swamp | West Branch Simms Stream | 3.4 | 0.0 | 3.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Blueberry Swamp | East Branch Simms Stream | 5.3 | 1.8 | 5.3 | 3.5 | 0 | 0 | 0 | 0 | |
| Blueberry Swamp | Cone Brook | 3.5 | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Blueberry Swamp | Lyman Brook | 3.9 | 0.0 | 3.9 | 0.0 | 0 | 0 | 0 | 0 | |
| Blueberry Swamp | Gore Brook | 3.9 | 0.0 | 3.9 | 0.0 | 0 | 0 | 0 | 0 | |
| Sprague Brook | Roaring Brook | 5.6 | 0.0 | 5.6 | 3.0 | 0 | 0 | 0 | 0 | |
| Sprague Brook | Mirey Brook | 5.3 | 0.0 | 5.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Sprague Brook | Brickyard Brook | 2.6 | 0.0 | 2.6 | 0.1 | 0 | 0 | 0 | 0 | |
| Sprague Brook | Tilsey Brook | 3.1 | 0.0 | 3.1 | 1.1 | 0 | 0 | 0 | 0 | |
| Sprague Brook | Jesse Brook | 1.3 | 0.0 | 1.3 | 0.0 | 0 | 0 | 0 | 0 | |
| **Massachusetts** | | | | | | | | | | |
| Sprague Brook | Kidder Brook (MA) | 1.6 | 0.0 | 1.6 | 0.0 | 0 | 0 | 0 | 0 | |
| *Westfield River* | *Westfield River, West Branch* | *16.9* | *0.2* | *16.9* | *7.3* | *7* | | *0* | *0* | *Fish-American eel, Atlantic salmon stocking, Eastern brook trout, Wildlife-Priority Habitats of Rare Species* |
| *Westfield River* | *Westfield River, Middle Branch* | *17.6* | *0.0* | *17.6* | *3.1* | *11* | *0* | *0* | *0* | *Fish- American eel, Atlantic salmon stocking, Eastern brook trout Wildlife-Priority Habitats of Rare Species* |
| *Westfield River* | *Westfield River, East Branch* | *60.0* | *0.0* | *19.3* | *0.0* | *25* | | *0* | *0* | *Fish- American eel, Atlantic salmon stocking, Eastern brook trout Wildlife-Priority Habitats of Rare Species* |
| Westfield River | Fuller Brook | 4.0 | 0.0 | 4.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Tuttle Brook | 3.8 | 0.0 | 3.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Glendale Brook | 5.5 | 0.0 | 5.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Factory Brook | 7.5 | 0.0 | 7.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Coles Brook | 5.5 | 0.0 | 5.5 | 5.5 | 0 | 0 | 0 | 0 | |
| Westfield River | Depot Brook | 5.3 | 0.0 | 5.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Savery Brook | 3.0 | 0.0 | 3.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Watson Brook | 2.2 | 0.0 | 2.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Shaker Mill Brook | 6.7 | 0.0 | 6.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Yokum Brook | 3.9 | 0.0 | 3.9 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Cushman Brook | 2.3 | 0.0 | 2.3 | 0.0 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| Westfield River | Roaring Brook | 5.5 | 0.0 | 5.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Westfield River | Watts Stream | 4.9 | 0.0 | 4.9 | 0.0 | 0 | 0 | 0 | 0 | |
| Fort River | Fort River | 11.9 | 3.0 | 11.9 | 5.6 | 0 | 0 | 0 | 0 | |
| Fort River | Hop Brook | 7.3 | 0.0 | 7.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Fort River | Amethyst Brook | 4.8 | 0.0 | 4.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Fort River | Buffam Brook | 2.3 | 0.0 | 2.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Fort River | Adams Brook | 2.4 | 0.0 | 2.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | West Branch Mill River | 5.3 | 0.0 | 5.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | East Branch Mill River | 4.2 | 0.0 | 4.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | Bradford Brook | 3.0 | 0.0 | 3.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | Beaver Brook | 3.6 | 0.0 | 3.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | Unquomonk Brook | 2.1 | 0.0 | 2.1 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | Roberts Meadow Brook | 3.4 | 0.0 | 3.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Mill River | Mill River | 11.6 | 0.0 | 11.6 | 1.5 | 0 | 0 | 0 | 0 | |
| *Farmington* | *Upper Farmington River (also known as the West Branch)* | *39.2* | *0.0* | *19.6* | *1.2* | *14* | | *0* | *0*[3] | *Recreation-Tens of thousands of people participate in fishing, boating, tubing, & other recreational activities.*<br>*Fish-High quality salmonid habitat. All migratory fish use this river. Steve Gephart called it the "Crown Jewel."*<br>*Wildlife-Year-round bald eagle use. Major forest block and New England Cottontail Focus Area.*<br>*Historic-Historic infrastructure, nationally recognized historic sites.*<br>*Prehistory-Several prehistoric sites documented including major sites occupied year-round and the river may have been a major trade route.* |
| Farmington | Riska Brook | 2.7 | 0.0 | 2.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Taylor Brook | 3.1 | 0.0 | 3.1 | 0.8 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| **Connecticut and Massachusetts** | | | | | | | | | | |
| *Farmington* | *Upper Farmington River* | *38.0* | *0.0* | *19.6* | *1.2* | *14.0* | | *14.0* | *14.0* | *Recreation-Tens of thousands of people participate in fishing, boating, tubing, and other recreational activities.*<br>*Fish-High quality salmonid habitat. All migratory fish use this river. Steve Gephart called it the "Crown Jewel."*<br>*Wildlife-Year-round bald eagle use. Major forest block & NEC Focus Area.*<br>*Historic-Historic infrastructure, nationally recognized historic sites.*<br>*Prehistory-Several prehistoric sites documented including major sites occupied year-round and the river may have been a major trade route.* |
| **Massachusetts** | | | | | | | | | | |
| Farmington | Sandy Brook CT/MA | 15.0 | 0.0 | 13.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Doolittle Lake Brook | 3.5 | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Slocum Brook CT/MA | 3.4 | 0.0 | 3.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Valley Brook CT/MA | 6.4 | 0.0 | 6.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Lower Farmington | 43.2 | 0 | 4.7 | 0 | 6.0 | 0 | 0[4] | 0 | |
| Farmington | Salmon Brook | 2.4 | 0.0 | 2.4 | 1.4 | 0 | 0 | 0[4] | 0 | |
| Farmington | East Branch Salmon Brook | 11.8 | 0.0 | 11.8 | 0.0 | 0 | 0 | 0[4] | 0 | |
| Farmington | West Branch Salmon Brook | 12.6 | 0 | 0 | 0 | 0 | 0 | 0[4] | 0 | |
| Farmington | Muddy Brook | 7.4 | 0.0 | 7.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Thorpe Brook | 1.2 | 0.0 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | |
| Farmington | Belden Brook | 2.5 | 0.0 | 2.5 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Philo Brook | 6.3 | 0.0 | 6.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Hop Brook | 6.3 | 0.0 | 6.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Farmington | Cherry Brook | 8.6 | 0.0 | 8.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Maromas | Hubbard Brook | 1.3 | 0.0 | 1.3 | 1.3 | 0 | 0 | 0 | 0 | |
| Maromas | Reservoir Brook | 1.8 | 0.0 | 1.8 | 0.4 | 0 | 0 | 0 | 0 | |
| Maromas | Summer Brook | 7.3 | 0.0 | 7.3 | 0.0 | 0 | 0 | 0 | 0 | |
| Maromas | Harris Brook | 1.4 | 0.0 | 1.4 | 0.0 | 0 | 0 | 0 | 0 | |
| Maromas | Round Hill Brook | 0.8 | 0.0 | 0.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Maromas | West Round Hill Brook | 1.0 | 0.0 | 1.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Maromas | Long Hill Brook | 4.3 | 0.0 | 4.3 | 0.0 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| Salmon River | Blackledge River | 15.9 | 0.0 | 15.9 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Foot Sawmill Brook | 3.6 | 0.0 | 3.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Fawn Brook | 8.8 | 0.0 | 8.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | West Branch Fawn Brook | 3.6 | 0.0 | 3.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Jeremy River | 10.6 | 0.0 | 1.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Raymond Brook | 5.6 | 0.0 | 5.6 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Judd Brook | 5.2 | 0.0 | 5.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Meadow Brook | 4.0 | 0.0 | 4.0 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Gillette Brook | 4.2 | 0.0 | 4.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Pine Book (Babcock WMA) | 3.2 | 0.0 | 3.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Moodus River | 4.0 | 0.0 | 4.0 | 0.8 | 0 | 0 | 0 | 0 | |
| Salmon River | Pine Brook (Salmon River) | 7.5 | 0.5 | 7.5 | 3.5 | 0 | 0 | 0 | 0 | |
| Salmon River | Salmon River | 10.3 | 0.3 | 10.2 | 3.7 | 0 | 0 | 0 | 0 | |
| Salmon River | Pocotopaug Creek | 3.9 | 0.0 | 3.9 | 0.4 | 0 | 0 | 0 | 0 | |
| Salmon River | Mine Brook | 3.3 | 0.0 | 3.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Salmon River | Safstrom Brook | 3.5 | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | |
| **Whalebone Cove** | **Eightmile River** | **10.8** | **0.0** | **10.8** | **0.9** | **0** | **10.8** | **10.8** | | **Watershed hydrology**<br>**Water quality.**<br>**Geology**<br>**Unique species & natural communities**<br>**Watershed ecosystem**<br>**Cultural landscape** |
| Whalebone Cove | Roaring Brook | 5.7 | 0.0 | 5.7 | 0.0 | 0 | 0 | 0 | 0 | |
| Whalebone Cove | Hemlock Valley Brook | 5.0 | 0.0 | 5.0 | 0.8 | 0 | 0 | 0 | | |
| Whalebone Cove | Succor Brook | 4.1 | 0.0 | 4.1 | 0.0 | 0 | 0 | 0 | | |
| Whalebone Cove | Early Brook | 3.4 | 0.0 | 3.4 | 0.0 | 0 | 0 | 0 | | |
| Whalebone Cove | Big Brook | 1.9 | 0.0 | 1.9 | 0.0 | 0 | 0 | 0 | | |
| Whalebone Cove | East Branch Eightmile River | 8.0 | 0.0 | 8.0 | 0.0 | 4.0 | 4.0 | 8.0 | | |
| Whalebone Cove | Beaver Brook | 11.6 | 0.0 | 11.6 | 0.0 | 0 | | 1.9 | | |
| Whalebone Cove | Lieutenant River | 2.8 | 0.0 | 2.8 | 0.0 | 0 | 0 | 0 | 0 | |
| Whalebone Cove | Black Hall River | 2.9 | 0.0 | 5.2 | 0.0 | 0 | 0 | 0 | 0 | |
| Whalebone Cove | Joshua Creek | 2.5 | 0.0 | 2.5 | 2.5 | 0 | 0 | 0 | 0 | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| Whalebone Cove | Harris Brook | 4.5 | 0 | 4.5 | 0 | 0 | 0 | 3.9 | 3.9 | |
| Whalebone Cove | Falls Brook | 1.6 | 0 | 1.6 | 0 | 0 | 0 | 0.7 | 0.7 | |
| Scantic River | Podunk River | 13.7 | 0.0 | *** | 2.3 | 0 | 0 | 0 | 0 | |
| Scantic River | Newberry Brook | 2.1 | 0.0 | *** | 1.5 | 0 | 0 | 0 | 0 | |
| Scantic River | Stoughton Brook | 1.9 | 0.0 | *** | 0.6 | 0 | 0 | 0 | 0 | |
| Scantic River | Scantic River | 37.1 | 0.0 | *** | | 0 | 0 | 0 | 0 | |
| Scantic River | Connecticut River | 4.2 | 0.0 | *** | 4.2 | 0 | 0 | 0 | 0 | |
| Pyquag | Beaver Brook | 2.1 | 0.0 | *** | 2.1 | 0 | 0 | 0 | 0 | |
| Pyquag | Salmon Brook | 7.1 | 0.0 | *** | 0.1 | 0 | 0 | 0 | 0 | |
| Pyquag | Hubbard Brook | 5.5 | 0.0 | *** | 1.6 | 0 | 0 | 0 | 0 | |
| Pyquag | Connecticut River | 8.7 | 0.0 | *** | 8.7 | 0 | 0 | 0 | 0 | |
| **Main Stem** | | | | | | | | | | |
| **Quonatuck - NH** | **Connecticut River - Fourth Connecticut Lake to Beecher Falls** | **29.0** | **0.0** | **0**[5] | **0.0** | **No** | [5] | **0** | [5] | **Scenic-(Segment passes by and provides excellent views of Monadnock Mountain, a regionally unique example of an open low mountain. Possesses one of the highest ranges of views in the entire northeast.)**<br>**Hydrologic-(A unique, sparsely developed, high-order river.)** |
| *Quonatuck - NH/ VT* | *Connecticut River - Beecher Falls to North Stratford* | *22.0* | *0.0* | *0*[5] | *0.0* | *22.0* | [5] | *0* | [5] | *Hydrologic-(A unique sparsely developed high order river.)*<br>*Scenic-(Segment passes by and provides excellent views of Monadnock Mountain, a regionally unique example of an open low mountain. Possess one of the highest ranges of views in the entire northeast.)* |
| *Quonatuck - NH/ VT* | *Connecticut River - North Stratford to Dalton* | *40.0* | *0.0* | *0*[5] | *0.0* | *40.0* | [5] | *0* | [5] | *Hydrologic-(A unique, sparsely developed, high order river. One of the most significant examples of fluvial deposition in the northeast region.)* |
| Quonatuck - NH/ VT | Connecticut River - Dalton to South Newbury | 48.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | 0 | [5] | |
| *Quonatuck - NH/ VT* | *Connecticut River - South Newbury to Confluence with Omponmanoosuc River* | *37.0* | *0.0* | *0*[5] | *0.0* | *37.0* | [5] | *0* | [5] | *Hydrologic-(One of the last remaining sparsely developed, free-flowing segments of a high order river in the section.)* |
| Quonatuck - NH/ VT | Connecticut River - Confluence with Omponmanoosuc River to Windsor | 24.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | 0 | [5] | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| *Quonatuck - NH/ VT* | *Connecticut River - Windsor to Confluence with the Williams River at South Charlestown* | *24.0* | *0.0* | *0*[5] | *0.0* | *24.0* | [5] | *0* | [5] | *Hydrologic-(One of three remaining sparsely developed free-flowing segments in this section.)* |
| Quonatuck - NH/ VT | Connecticut River - Confluence with the Williams River at South Charlestown to Route 123 bridge at Walpole | 8.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | | 5 | |
| *Quonatuck - NH/ VT* | *Connecticut River - Route 123 bridge at Walpole to 1 mile above Route 9 bridge* | *18.0* | *0.0* | *0*[5] | *0.0* | *18.0* | [5] | *0* | [5] | *Hydrologic-(One of three remaining sparsely developed free-flowing segments of a unique high order river in this section.)*<br>*Botanic-(Segment includes calcareous soils unique to this segment supporting rare plant species unusual to this section of the Connecticut River Valley.)*<br>*Historic-(Segment includes the site of the first bridge over the Connecticut River, a toll bridge constructed in 1785 in Walpole.)* |
| Quonatuck - NH/ VT/MA | Connecticut River - 1 mile above Route 9 bridge to Schell Bridge | 16.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | 0 | [5] | |
| *Quonatuck - MA* | *Connecticut River - Schell Bridge to Turners Falls* | *9.0* | *0.0* | *0*[5] | *0.0* | *9.0* | [5] | *0* | [5] | *Hydrologic-(An undeveloped, high order river segment.)* |
| Quonatuck - MA/ CT | Connecticut River - Turners Falls to I-91 Bridge in Windsor Locks | 60.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | 0 | [5] | |
| *Quonatuck - CT* | *Connecticut River - I-91 Bridge to Above Bissell Bridge* | *5.0* | *0.0* | *0*[5] | *0.0* | *5.0* | [5] | *0* | [5] | *Hydrologic-(One of two remaining relatively undeveloped, free flowing high order river segments.)*<br>*Recreation-(A unique proximity to high concentrations of urban populations in Hartsford.)*<br>*Fish-(River is an historic Atlantic Salmon fishery.)* |
| Quonatuck - CT | Connecticut River - Bissell Bridge to Tylerville (Whalebone Cove CFA) | 37.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | 0 | [5] | |

| Division/CPA/CFA/ | River Name | Total River Miles | Miles on Existing Refuge Lands | Miles of River in CPA | Miles of River in CFA | Miles included on NRI1 | Miles of NRI in CPA | Total Miles of W&S2 | Miles of W&S in CPA | Outstanding Remarkable Values |
|---|---|---|---|---|---|---|---|---|---|---|
| *Quonatuck - CT* | *Connecticut River - Tylerville (Whalebone Cove CFA) to Essex* | *9.0* | *0.0* | *0*[5] | *0.0* | *9.0* | [5] | *0* | [5] | *Wildlife-(Corridor includes coves and meadows which provide significant wildlife habitat in close proximity to urban areas.)*<br>*Hydrologic-(Segment is one of two remaining relatively undeveloped, free-flowing high order river segments in the southernmost portion of the New England Upland section.)*<br>*Fish-(River is an historic Atlantic Salmon fishery.)*<br>*Scenic-(Segment offers a variety of views related to the juxtaposition of land, land use, vegetation, and stream channel variation.)*<br>*Geologic-(Segment includes the significant Chapman Falls, cascading some 60 feet into a deep gorge called Devil's Hopyard.)* |
| Quonatuck - CT | Connecticut River - Essex to Mouth | 6.0 | 0.0 | 0[5] | 0.0 | 0.0 | [5] | 0 | [5] | |

*Italics=Included on the National Rivers Inventory.*

**Bold=Designated as a Federal Wild, Scenic, or Recreational River.**

[1] Nationwide Rivers Inventory (*http://www.nps.gov/ncrc/programs/rtca/nri/index.html)*

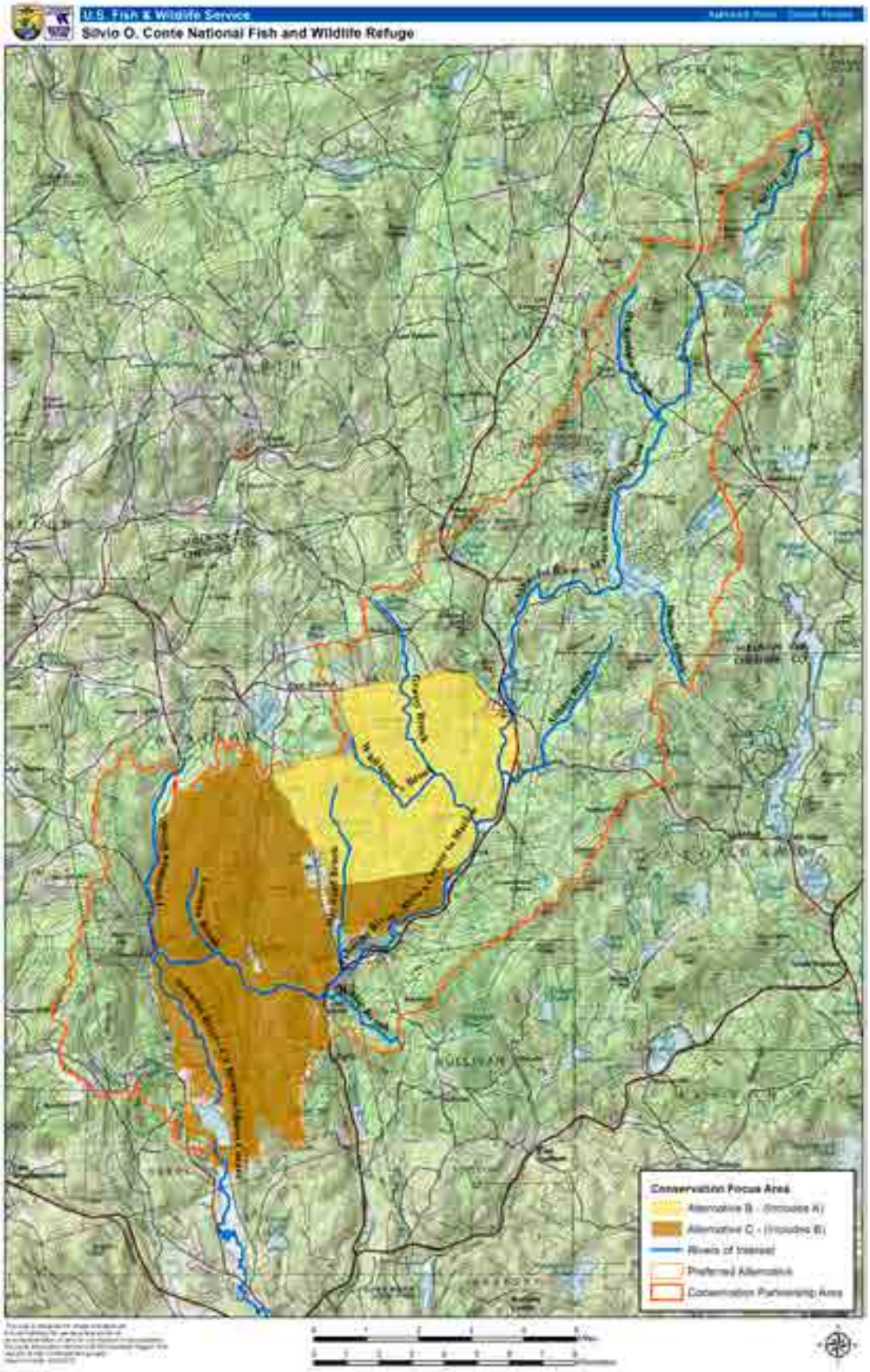
[2] National Wild and Scenic Rivers System (*http://www.rivers.gov/index.php*)

[3] In 1994, 11 miles of the Upper Farmington River (also known as the West Branch) where found to be Eligible, but not Suitable for Wild and Scenic Designation. U.S. Department of Interior, National Park Service in Cooperation with The Farmington River Study Committee. 1995. Farmington Wild and Scenic river Study. Northeast Region. Boston, MA. 145pp (*http://www.farmingtonriver.org/ProjectsandReports/Reports/tabid/74/Default.aspx*).

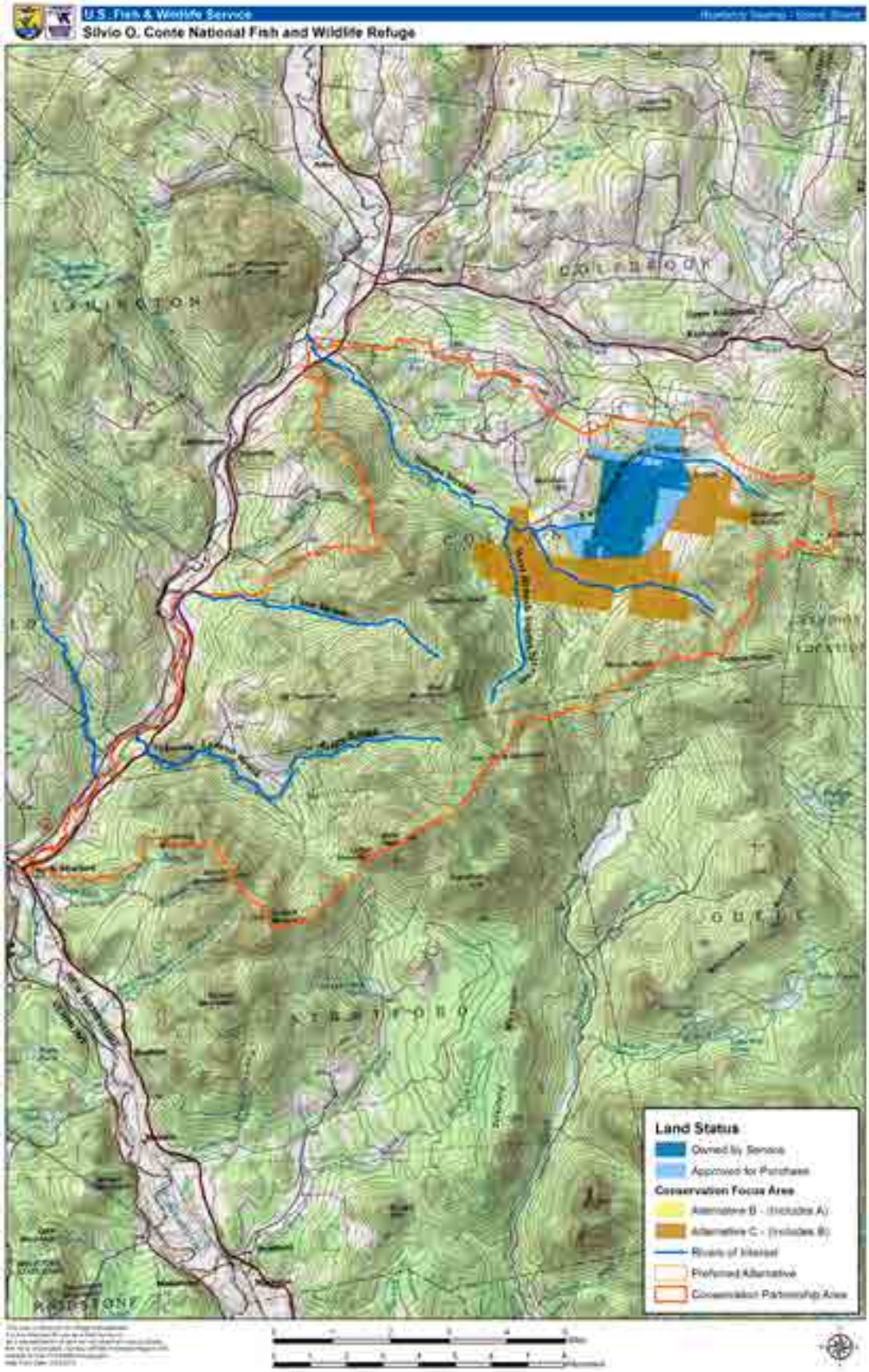
[4] 36.5 miles of the Lower Farmington River, 11.4 miles of the East Branch Salmon Brook, 12.6 miles of West Branch Salmon Brook, and 2.4 miles of the Salmon Brook mainstem were found to be Eligible and Suitable for Wild and Scenic River status in 2011 (U.S. Department of Interior, National Park Service. 2011. Lower Farmington River and Salmon Brook Wild and Scenic River Study, Study Report and Environmental Assessment. Northeast Region, Boston, MA 134 pp) (*http://parkplanning.nps.gov/document.cfm?parkID=261&projectID=35651&documentID=48466*).

[5] No Conservation Partnership Areas are delineated on the Connecticut River main stem

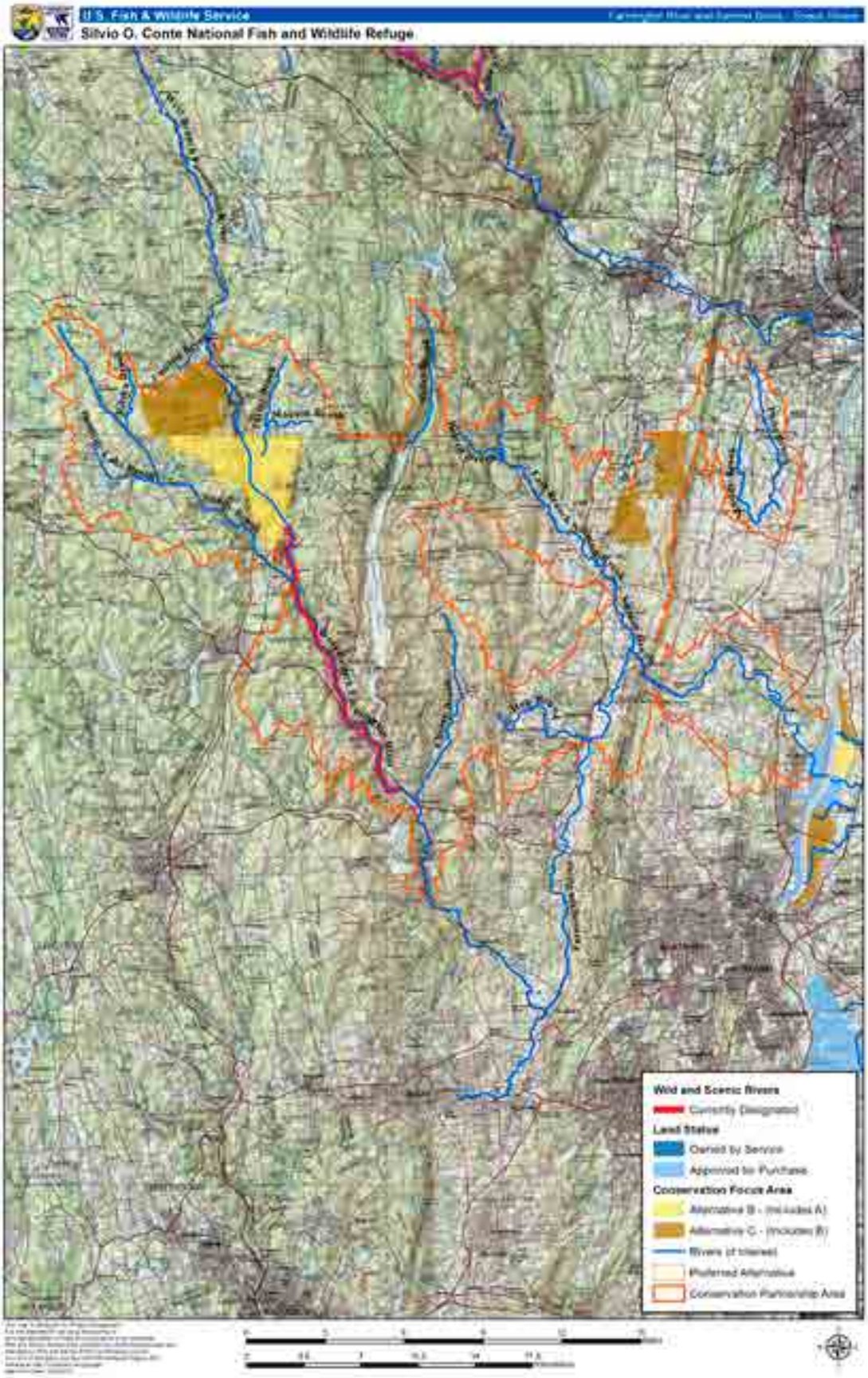
*Map F.1. Ashuelot River CPA – Wild and Scenic River Inventory.*



*Map F.2. Blueberry Swamp CPA – Wild and Scenic River Inventory.*



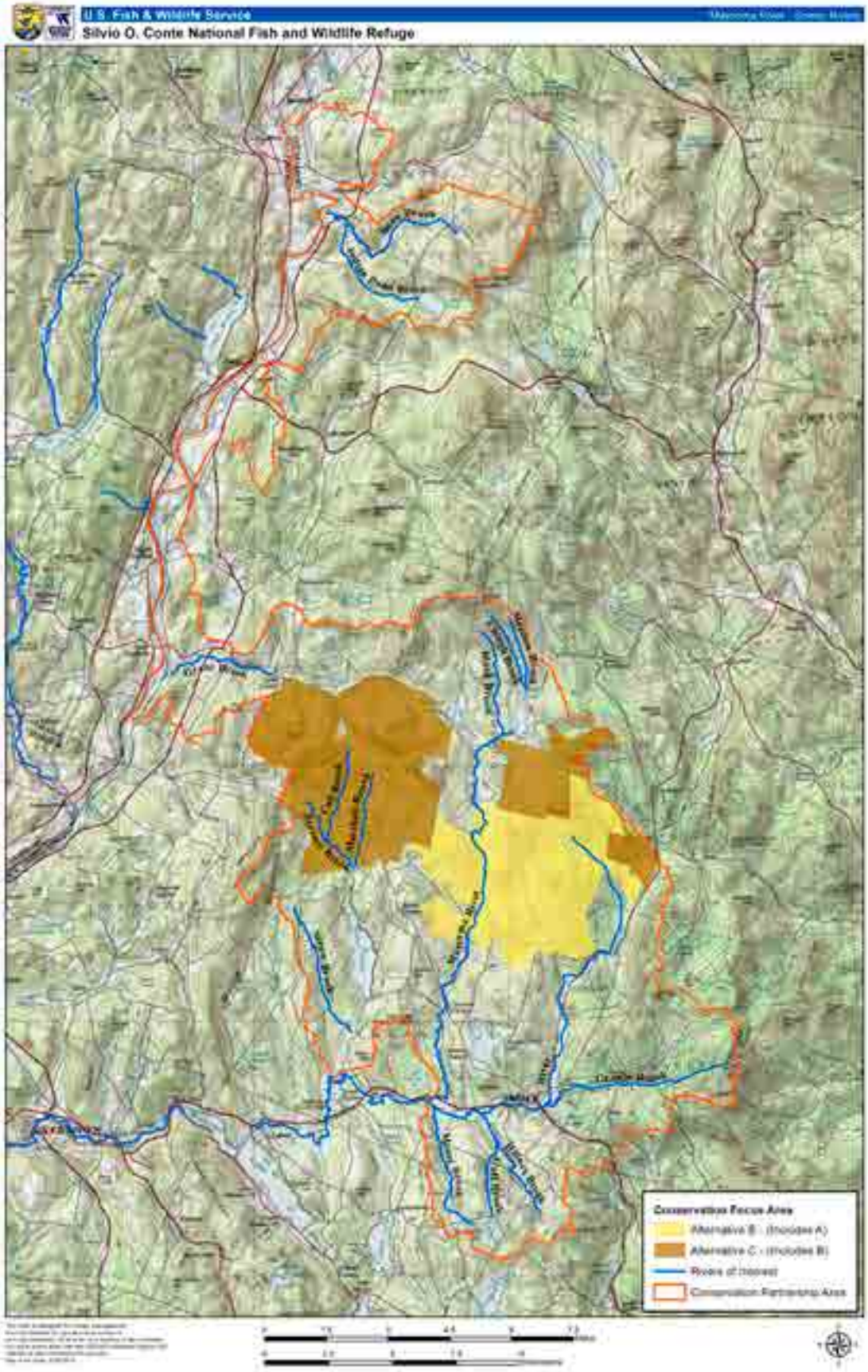
*Map F.3. Farmington River CPA – Wild and Scenic River Inventory.*



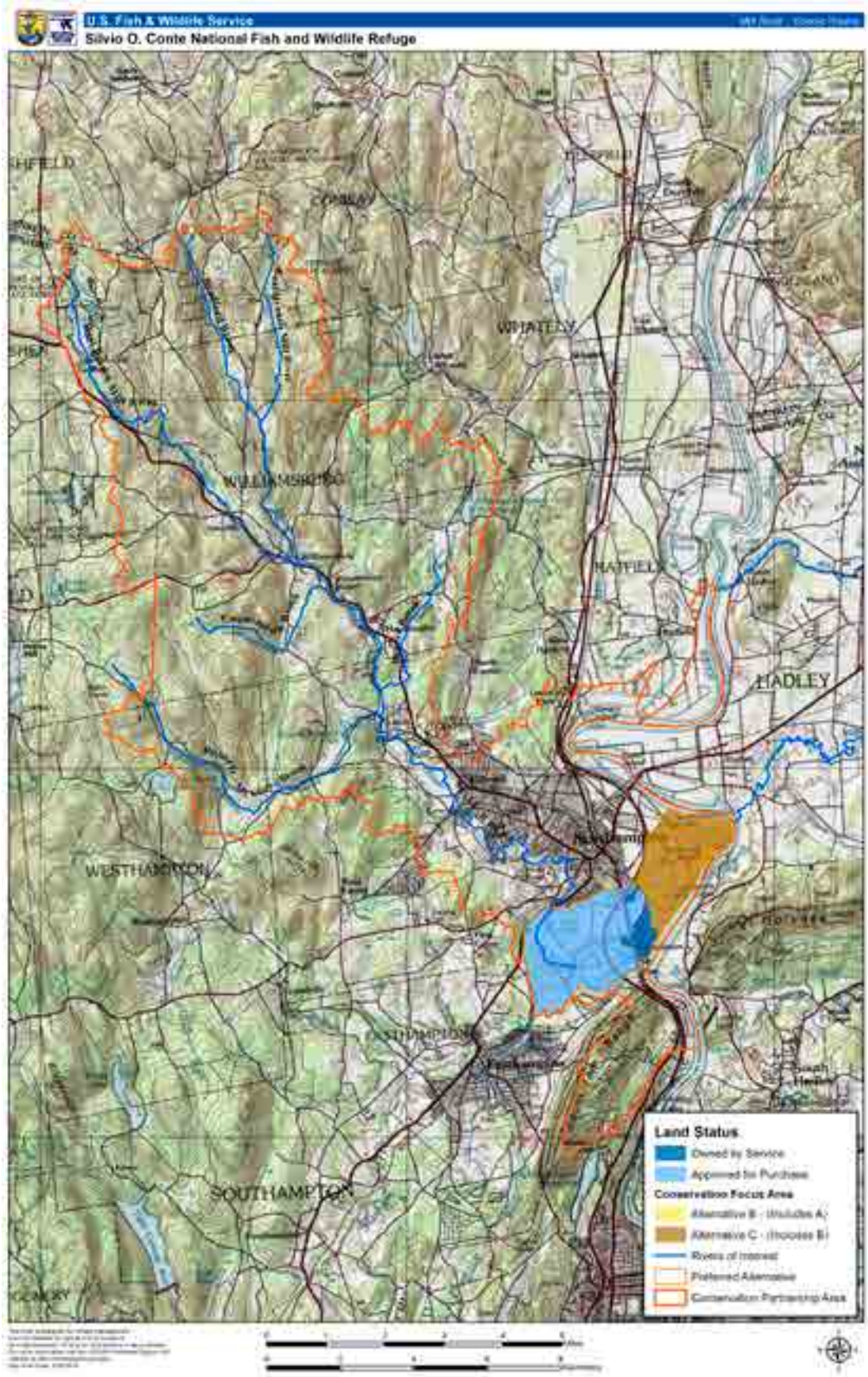
*Map F.4. Fort River CPA – Wild and Scenic River Inventory.*

*Map F.5. Maromas CPA – Wild and Scenic River Inventory.*

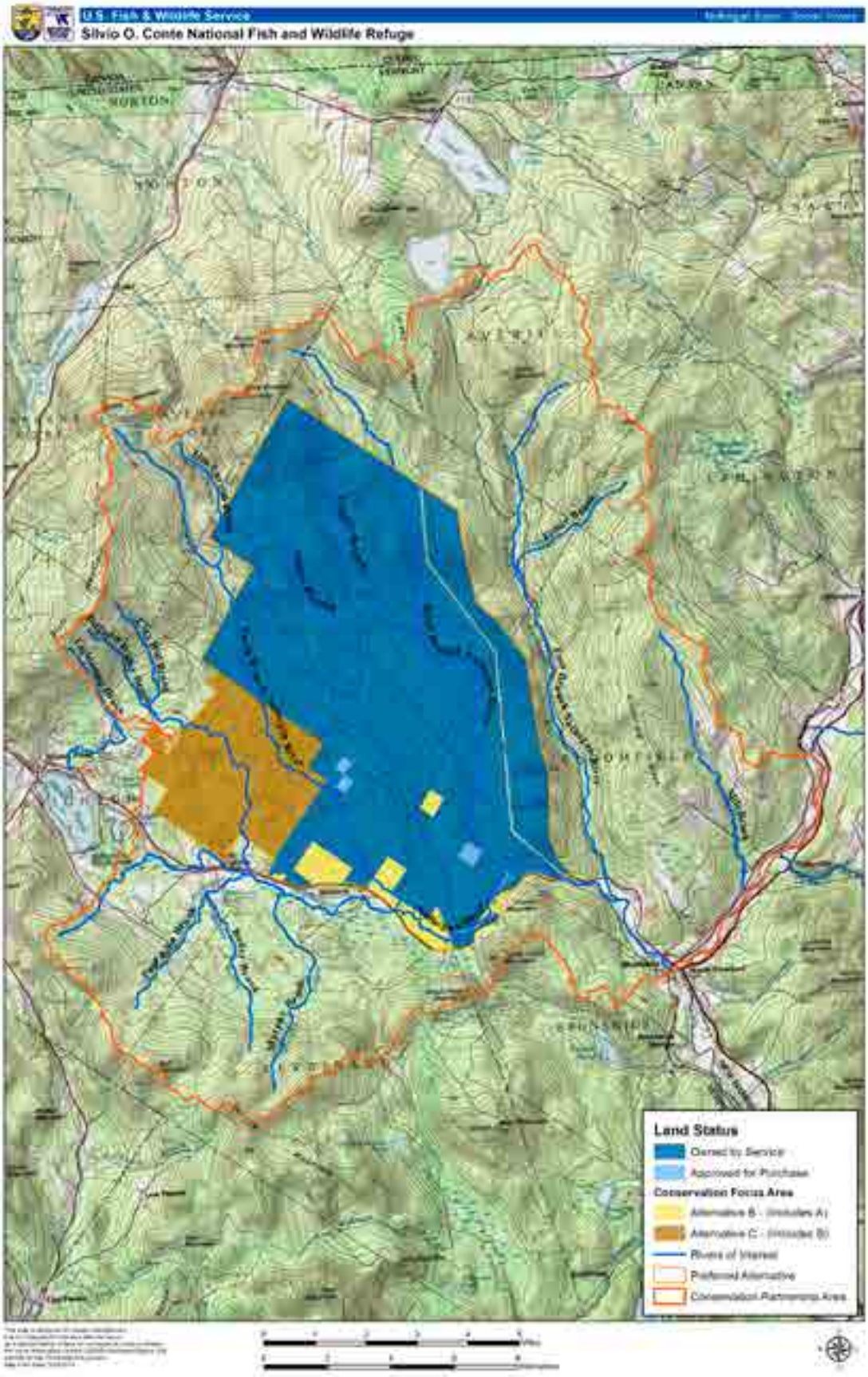
*Map F.6. Mascoma River CPA – Wild and Scenic River Inventory.*



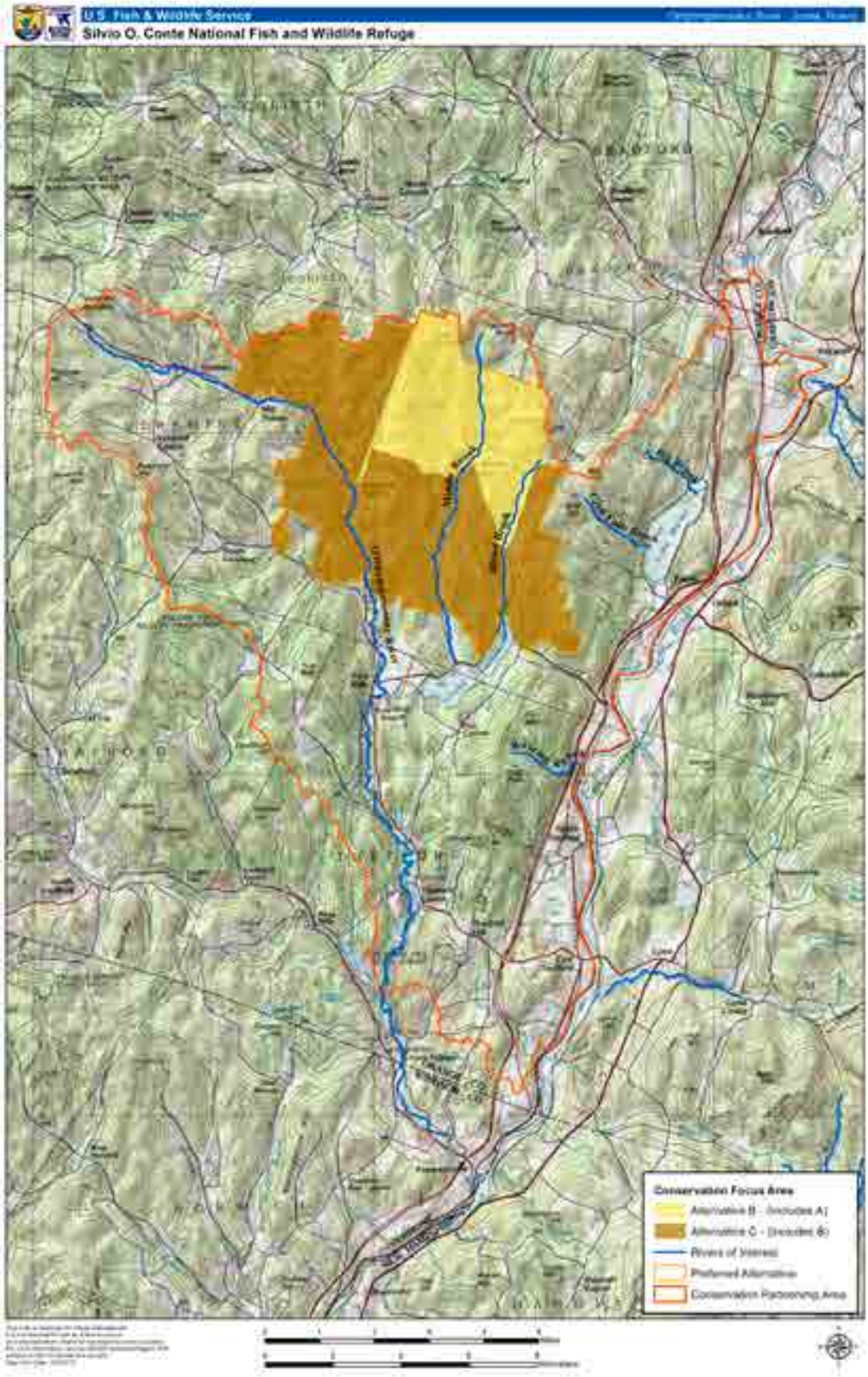
*Map F.7. Mill River CPA – Wild and Scenic River Inventory.*



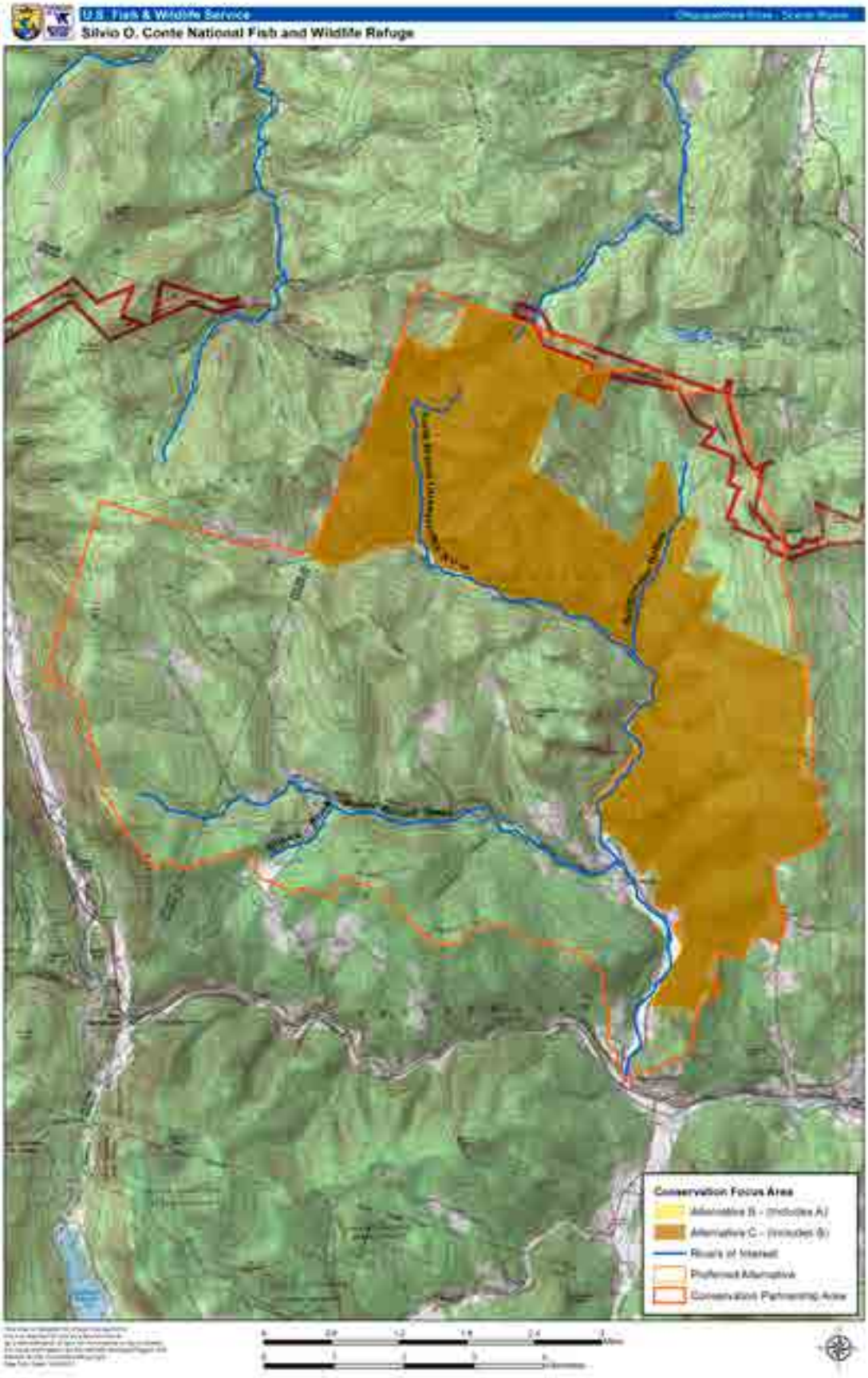
*Map F.8. Nulhegan Basin CPA – Wild and Scenic River Inventory.*



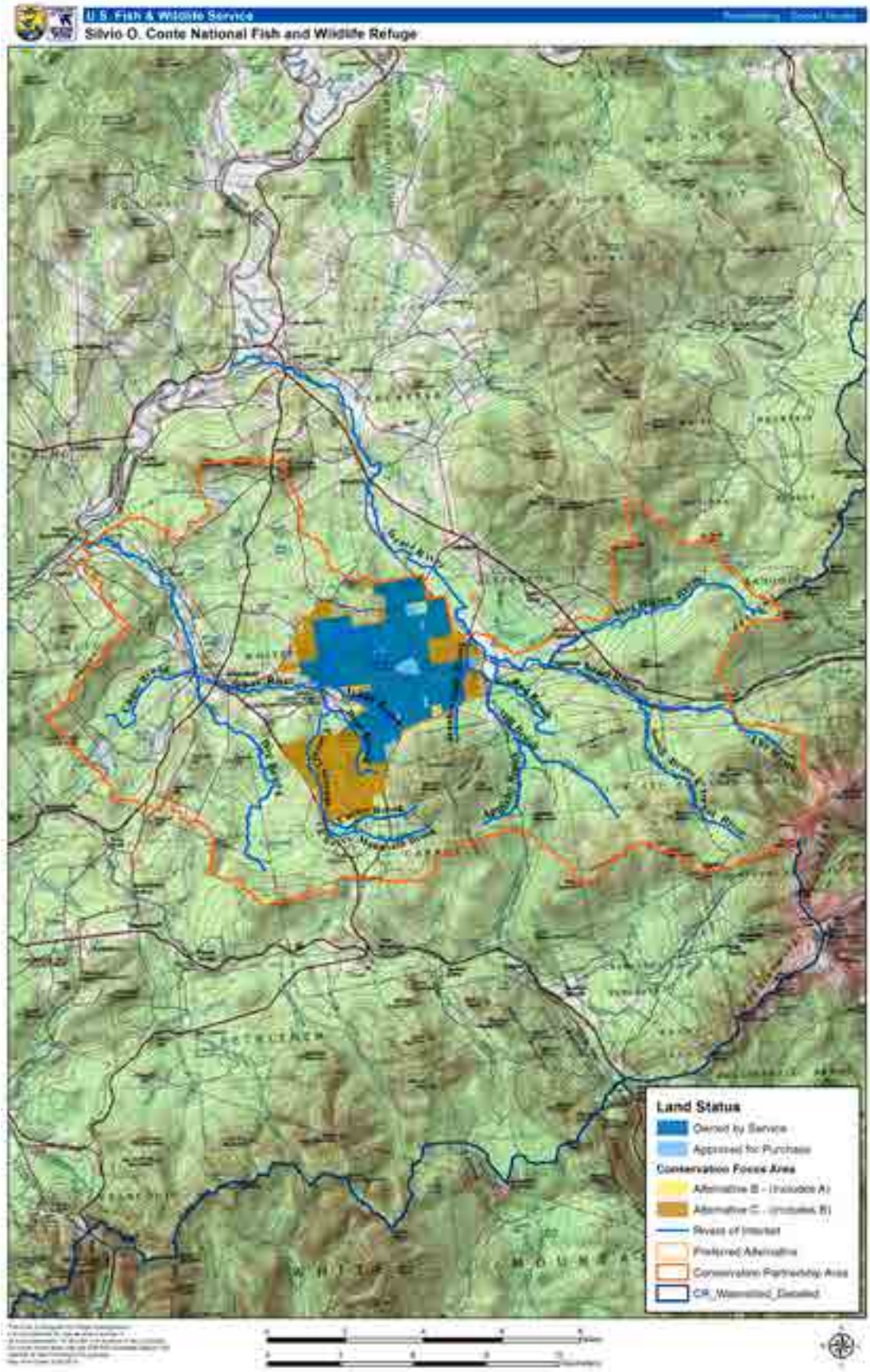
*Map F.9. Ompompanoosuc River CPA – Wild and Scenic River Inventory.*



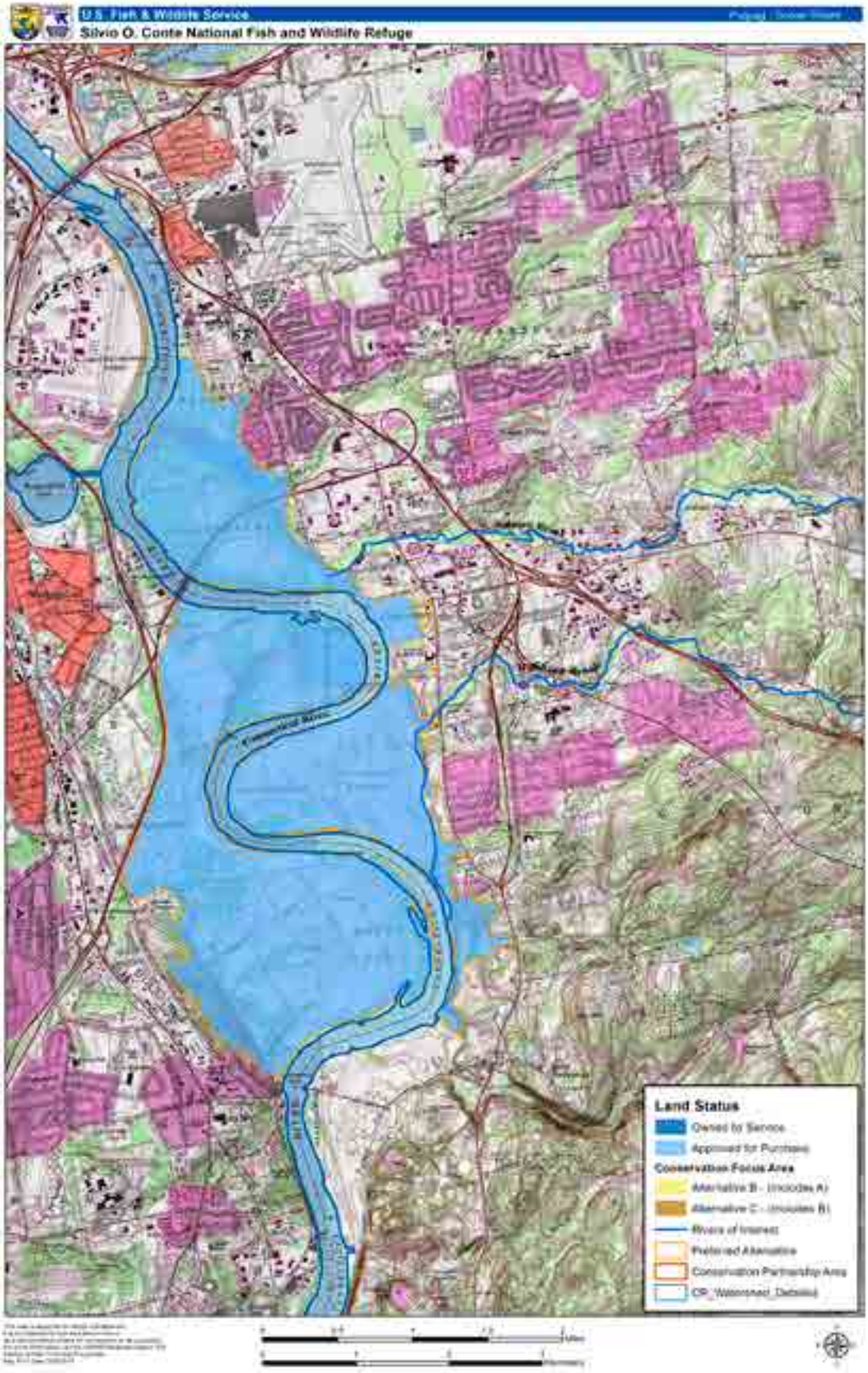
*Map F.10. Ottauquechee River CPA – Wild and Scenic River Inventory.*



*Map F.11. Pondicherry CPA – Wild and Scenic River Inventory.*

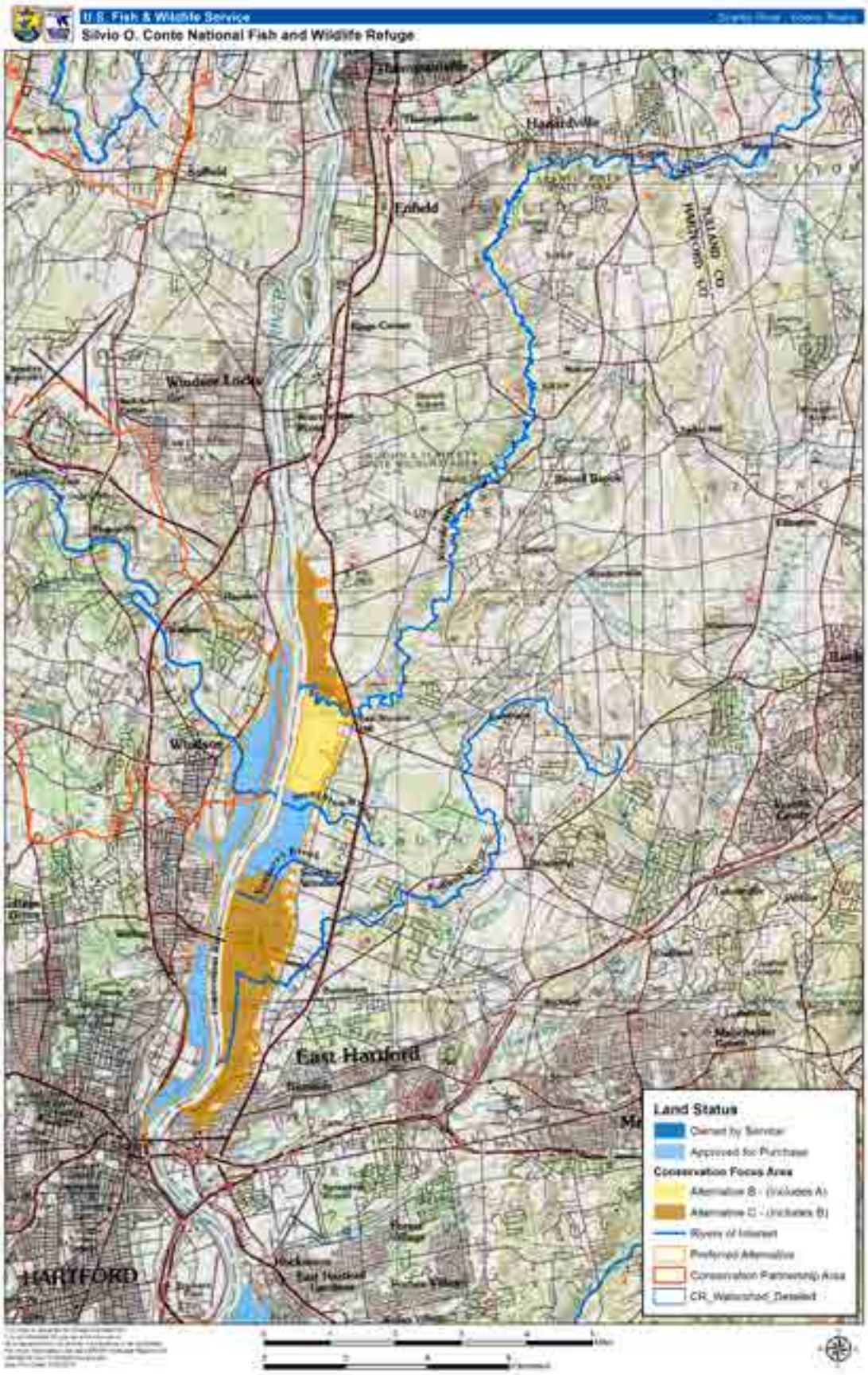


*Map F.12. Pyquag CFA – Wild and Scenic River Inventory.*

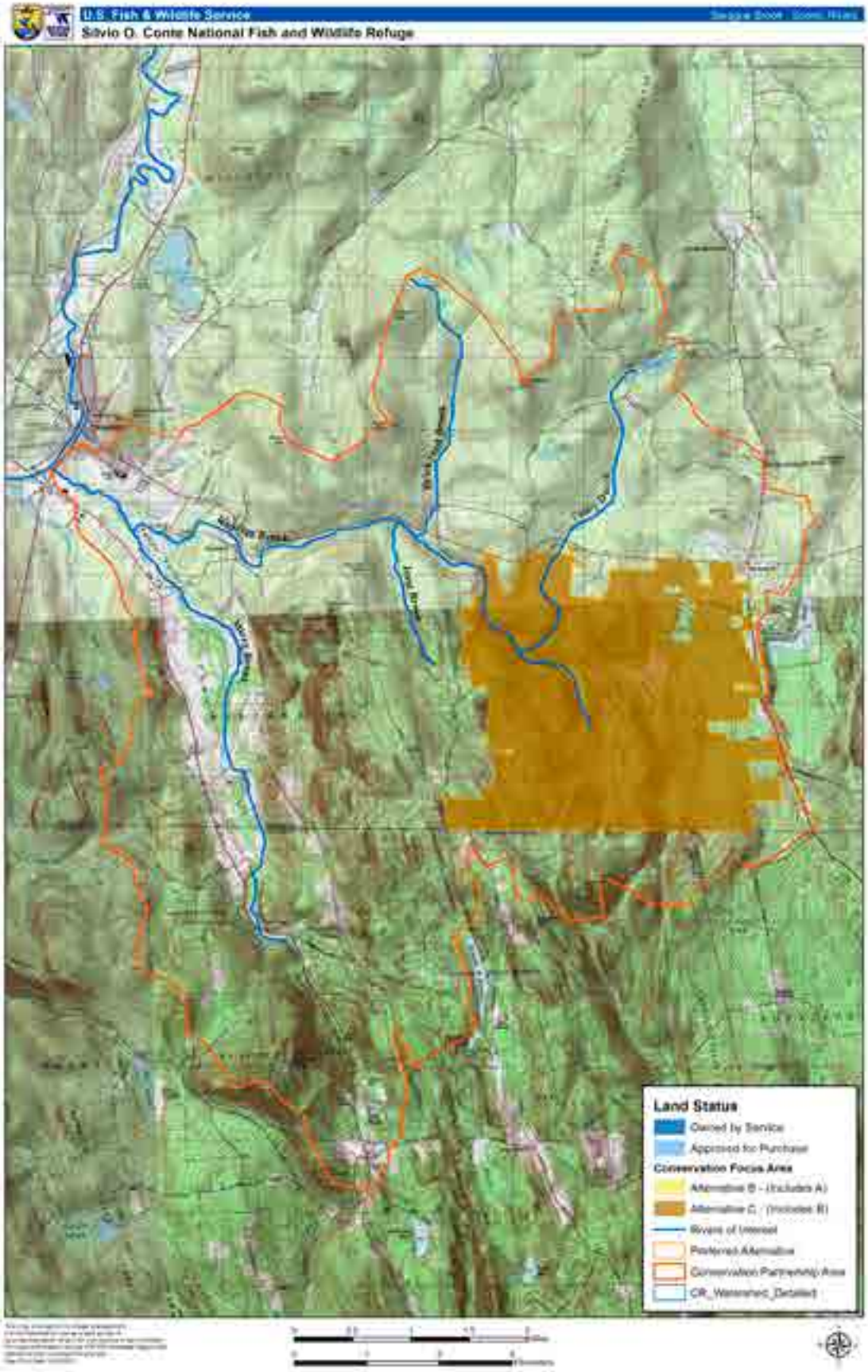


*Map F.13. Salmon River CPA – Wild and Scenic River Inventory.*

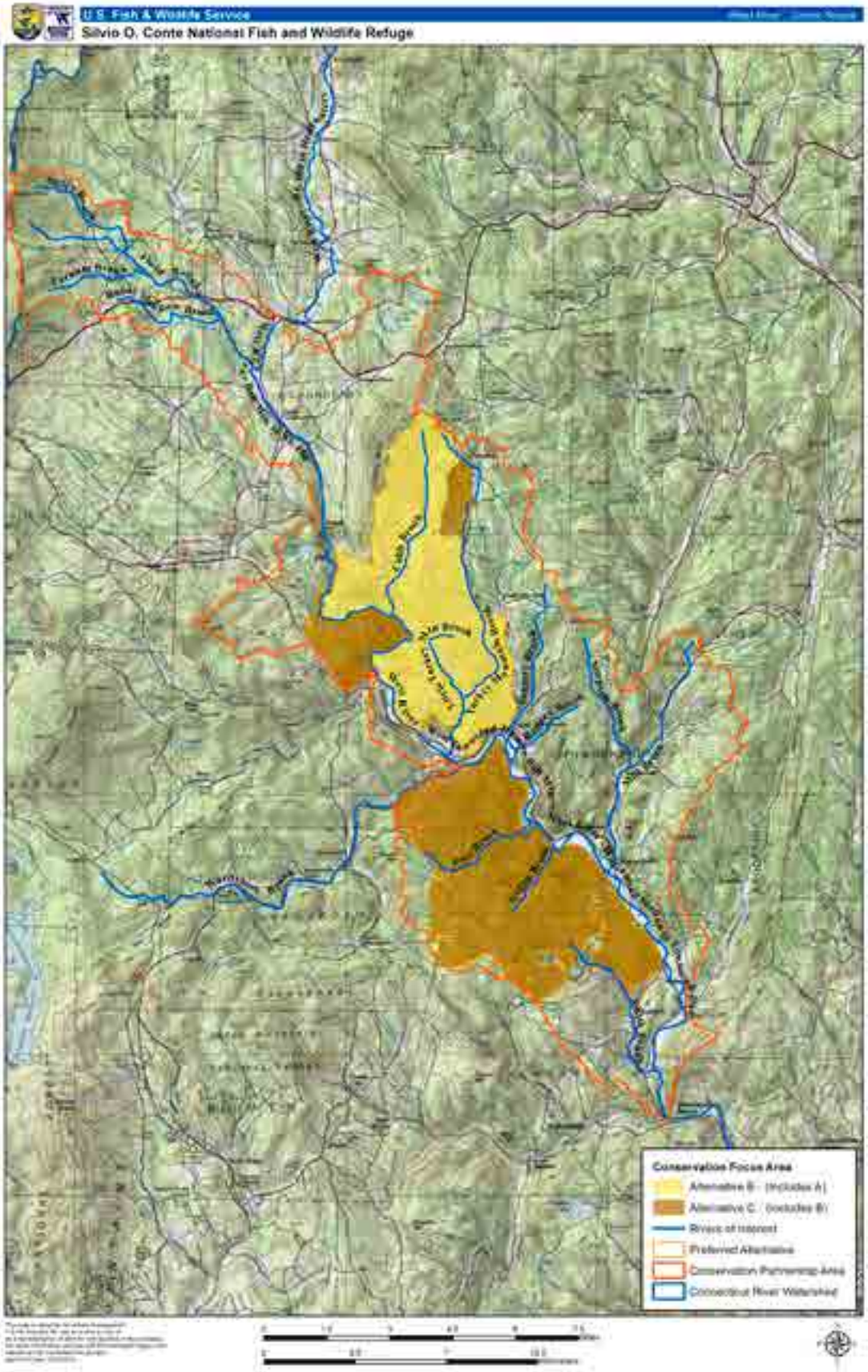
*Map F.14. Scantic River CFA – Wild and Scenic River Inventory.*



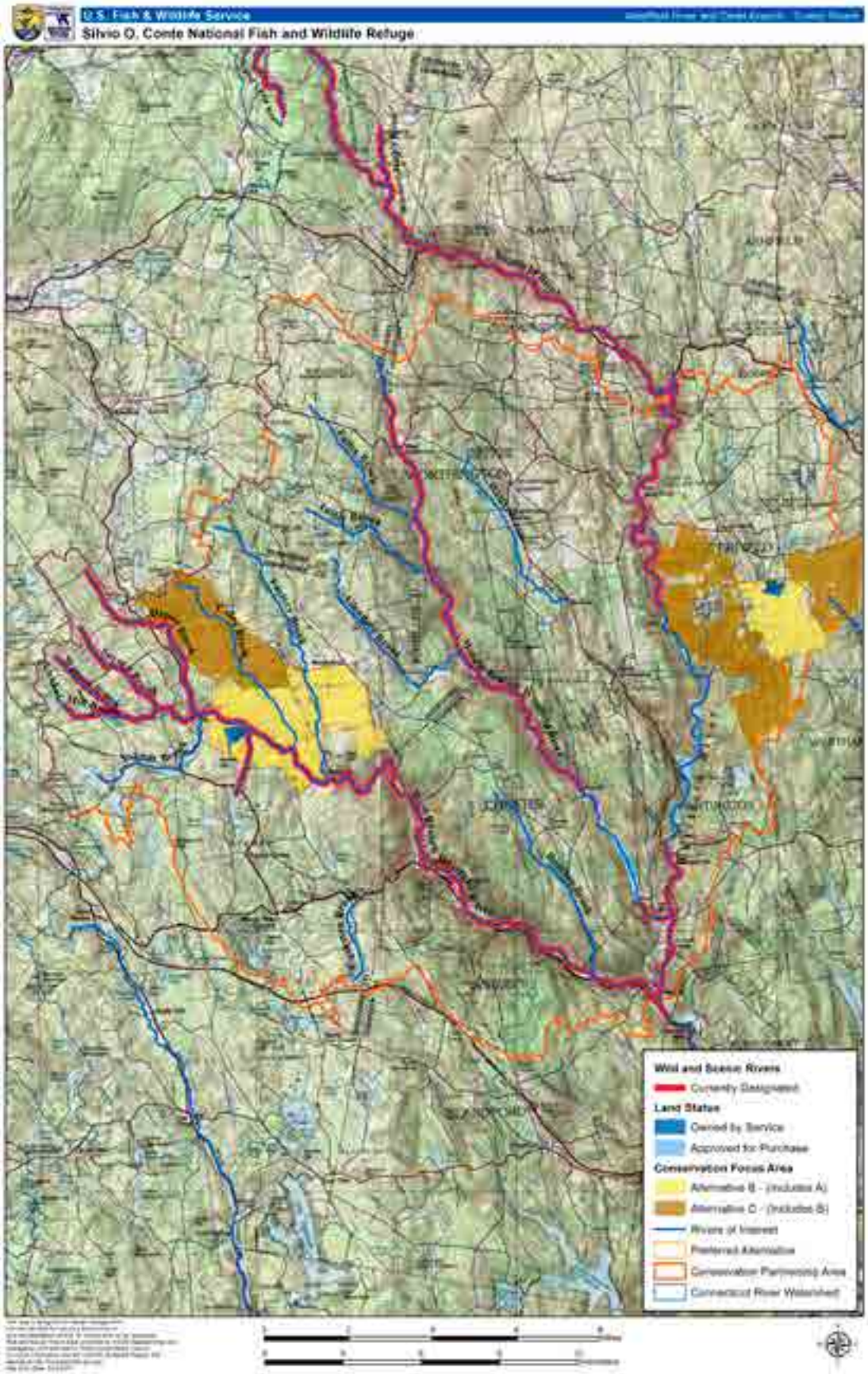
*Map F.15. Sprague Brook CPA – Wild and Scenic River Inventory.*



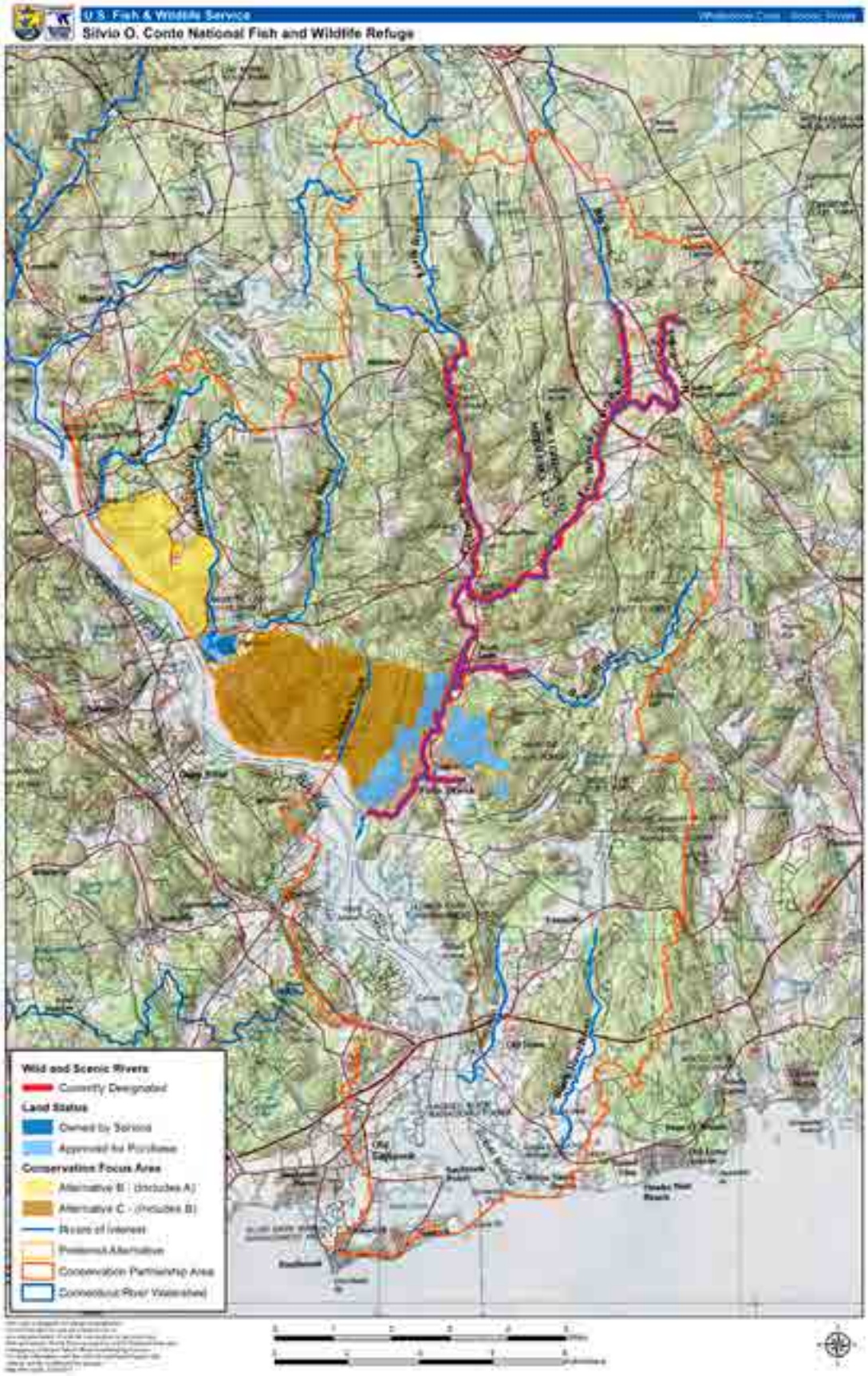
*Map F.16. West River CPA – Wild and Scenic River Inventory.*



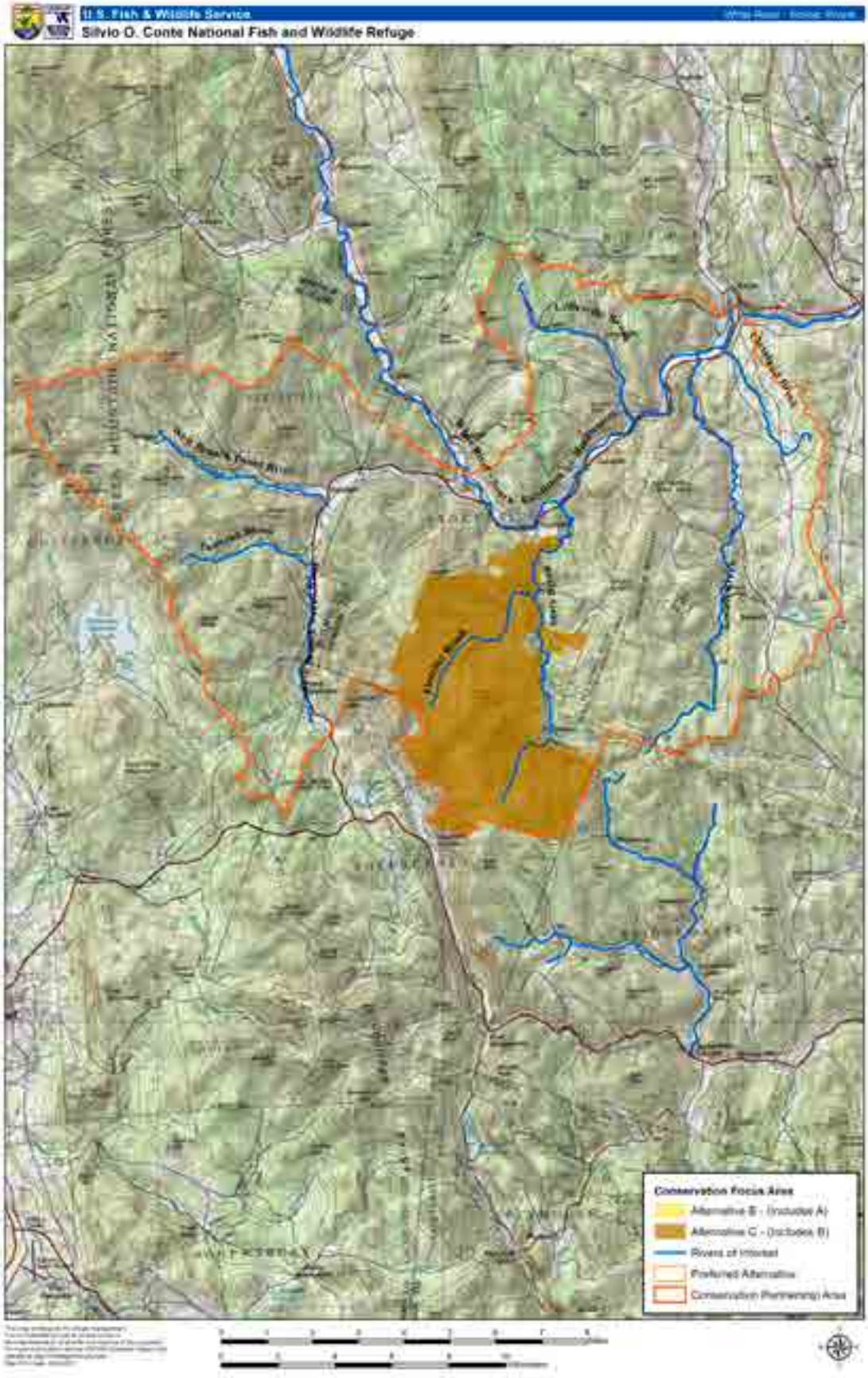
*Map F.17. Westfield River River CPA – Wild and Scenic River Inventory.*



*Map F.18. Whalebone Cove CFA – Wild and Scenic River Inventory.*



*Map F.19. White River CFA – Wild and Scenic River Inventory.*



Appendix G

USFWS

*Spruce grouse*

# Refuge Operations Needs System (RONS) and Service Asset Maintenance Management System (SAMMS)

- **Refuge Operation Needs System and Service Asset Maintenance Management System**

## Refuge Operation Needs System and Service Asset Maintenance Management System

The budget requests for Silvio O. Conte National Fish and Wildlife Refuge's (Conte Refuge) listed in the Refuge Operating Needs System (RONS) and Service Asset and Maintenance Management System (SAMMS) databases include a wide variety of new staffing, projects, and maintenance needs. The RONS and SAMMS lists are regularly updated to include priority projects. Contact the refuge for the most current RONS and SAMMS lists.

**Table G.1. Existing and Proposed Staff Positions and Projects Under Alternative C (Service-preferred Alternative) for Silvio O. Conte National Fish and Wildlife Refuge***

| Station Priority Rank | Project/Staff Position Description | Currently in RONS system? | Estimated One-time cost | Running Base Cost | Total First Year Need | FTE† |
|---|---|---|---|---|---|---|
| ***Staff Positions*** | | | | | | |
| 1 | Hire Private Lands/ Partnership Biologist | Yes | | 98,413 | 98,413 | 1.0 |
| 2 | Hire WoW Express – Mobile Visitor Center Manager | Yes | | 98,413 | 98,413 | 1.0 |
| 3 | Hire Maintenance Worker – Northern Divisions | Yes | | 77,650 | 77,650 | 1.0 |
| 4 | Hire Forestry Technician | Yes | | 73,800 | 73,800 | 1.0 |
| 5 | Hire Federal Wildlife Officer – Northern Divisions (costs represent increase from current half time position to full time) | No | | 42,267 | 42,267 | 0.5 to 1.0 |
| 6 | Hire Federal Wildlife Officer – Southern Divisions (half time) | No | | 46,583 | 46,583 | 0.5 |
| 7 | Hire Wildlife Refuge Manager (Trainee position) | No | | 81,337 | 81,337 | 1.0 |
| 8 | Hire Wildlife Biologist – Southern Divisions | No | | 81,337 | 81,337 | 1.0 |
| 9 | Hire Fisheries Biologist | Yes | | 117,955 | 117,955 | 1.0 |
| 10 | Hire Park Ranger – Northern Divisions | No | | 73,800 | 73,800 | 1.0 |
| 11 | Hire Maintenance Worker – Southern Divisions | No | | 77,650 | 77,650 | 1.0 |
| 12 | Hire Park Ranger – Southern Divisions | Yes | | 98,413 | 98,413 | 1.0 |
| 13 | Hire Administrative Assistant – Northern Divisions (Part-time) | No | | 30,168 | 30,168 | 0.5 |
| 14 | Hire Administrative Assistant – Southern Divisions (Part-time) | No | | 33,249 | 33,249 | 0.5 |
| 15 | Hire Supervisory Ecologist | No | | 117,955 | 117,955 | 1.0 |
| 16 | Hire Wildlife Refuge Manager – Northern Divisions | No | | 107,024 | 107,024 | 1.0 |

| Station Priority Rank | Project/Staff Position Description | Currently in RONS system? | Estimated One-time cost | Running Base Cost | Total First Year Need | FTE† |
|---|---|---|---|---|---|---|
| ***Projects*** | | | | | | |
| **1** | Provide habitat management through invasive species control on multiple refuges | Yes | - | $137,165 | $137,165 | 1.0 |
| **2** | Develop mitigation for road impacts to wetlands | Yes | $87,000 | - | $87,000 | - |
| **3** | Wildlife, fish, and habitat surveys on the Conte Refuge Complex | Yes | $85,000 | $50,000 | $187,549 | - |
| **4** | Information kiosks at partner venues in the watershed (Conte Corners) | Yes | $250,000 | $11,000 | $261,000 | - |
| **5** | Adaptation corridor for climate change | Yes | $290,000 | $131,000 | $526,098 | - |
| **6** | Brochures for the Conte Refuge Complex | Yes | $60,000 | - | $60,000 | - |
| **7** | Forest habitat management and restoration | No | $285,000 | $25,000 | $35,000 | |

**Staff salaries based on position's full performance level step-6 at either the Hartford, CT (MA), or rest of US (VT) locality regions, plus benefit calculations of 32% (GS), 35% (WG), and 47% (GL). Staff position projects align with the proposed staffing chart for alternative C, the preferred alternative, and updates/replaces the preexisting RONS table.*

*† FTE= Full-time equivalent (i.e., full-time staff position)*

**Table G.2. Existing and Proposed Maintenance Projects Under Alternative C (Service-preferred Alternative) for Silvio O. Conte National Fish and Wildlife Refuge**

| Project Number | Project Description | Currently in SAMMS system? | Refuge Division or Unit | Estimated Cost |
|---|---|---|---|---|
| Not Assigned Yet | Construct public access trails at various divisions following their establishment | No | Various Divisions | $185,000 |
| Not Assigned Yet | Trail work | No | Pondicherry Division | |
| Not Assigned Yet | Construct visitor contact facility | No | Fort River Division | |
| 10065442 | Replace two windows and repair rotting frames at quarters. Repair rotting kick board. | Yes | Blueberry Swamp Division | $5,000 |
| 2011205446 | Remove horse stable (Fort River Barn) | Yes | Fort River Division | $176,8000 |
| 10062533 | Demolish deteriorating stables building | Yes | Fort River Division | $150,000 |
| 2008795634 | Repair bridge over Logger Branch Tin and Eagle | Yes | Nulhegan Basin Division | $106,000 |
| 2008861288 | Repair visitor contact station entryway roof and install solar panels/arrays | Yes | Nulhegan Basin Division | $88,000 |
| 2007728492 | Rehabilitate Spigot Rail Trail (North Branch Trail) | Yes | Nulhegan Basin Division | $58,400 |
| Not assigned yet | Maintain and repair bridge network (5 bridges), including sandblasting, painting steel stringers, cleaning abutments of debris, re-decking, and maintaining side rails. | Yes | Nulhegan Basin Division | $73,000 |
| 10024433 | Rehabilitate public road network (5 miles total; replace culverts and clean roadside ditches) | Yes | Nulhegan Basin Division | $125,000 |
| Not assigned yet | Construct multiple visitor enhancements (informational kiosks, gravel parking areas, gates, ADA-compliant fishing access and rustic pedestrian trails) | Yes | Nulhegan Basin Division | $70,000 |
| 2008865070 | Replace damaged taxidermy and exhibits | Yes | Pondicherry Division | $225,000 |
| 05139145 | Replace Informational Kiosk at Route 116 | Yes | Pondicherry Division | $5,000 |
| 05138661 | Rehabilitate Cherry Pond Trail System | Yes | Pondicherry Division | $5,000 |
| 05138663 | Rehabilitate Cohos Trail | Yes | Pondicherry Division | $13,000 |
| Not assigned yet | Demolish and remove collapsing garage/shop (may contain asbestos or lead paint) | No | Salmon River Division | $8,000 |
| Not assigned yet | Construct a fully accessible trail at the Salmon River Division | No | Salmon River Division | $100,000 |
| Not assigned yet | Repair York House and garage, including electrical, plumbing, and waste system to meet codes, replacing windows and siding, and repairing interior walls and floors | No | Roger Tory Peterson Unit | $20,000 |

# Appendix H

Ryan Hagerty/USFWS

*Banding birds at Nulhegan Basin Division*

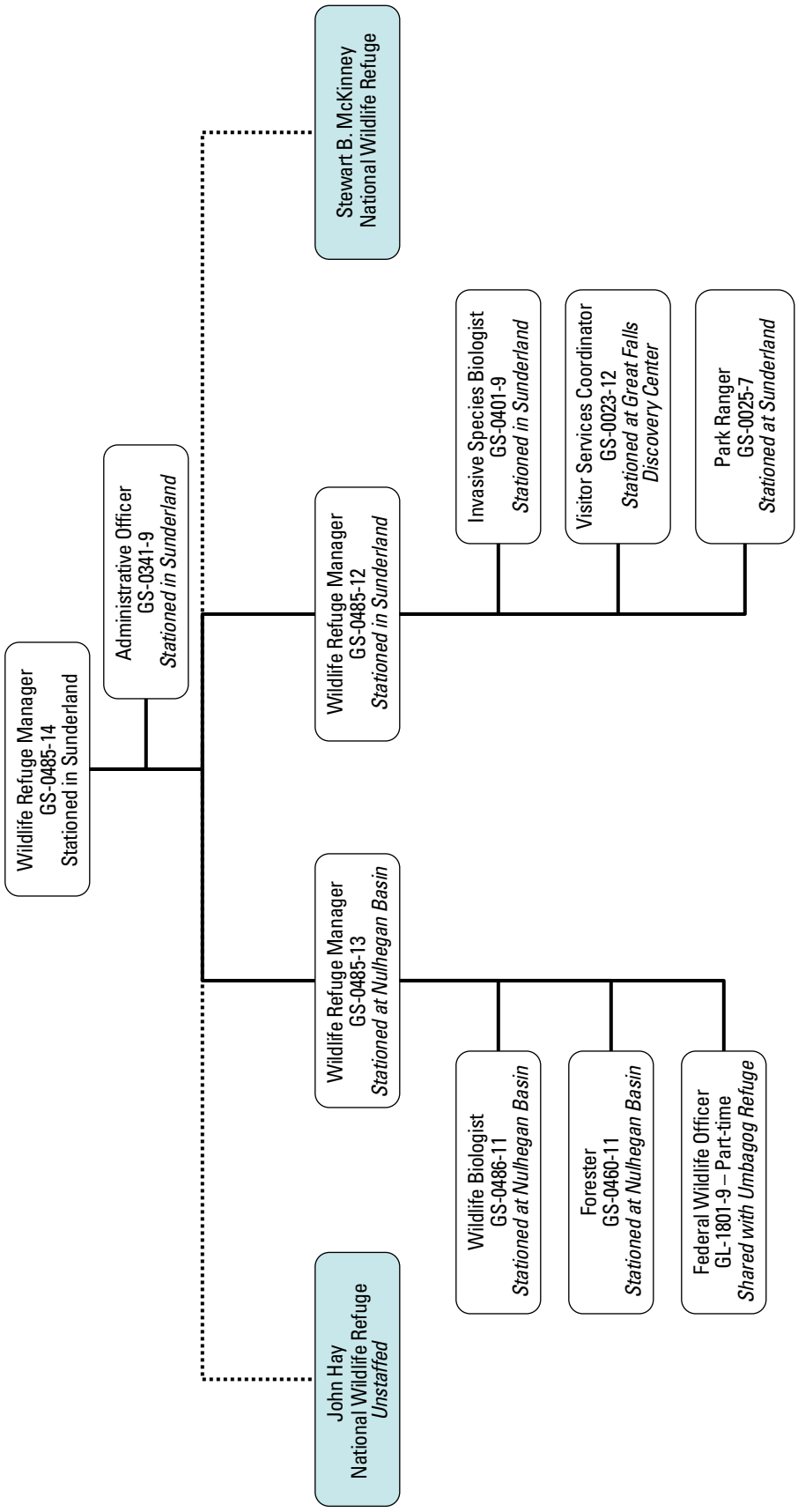
# Staffing Charts

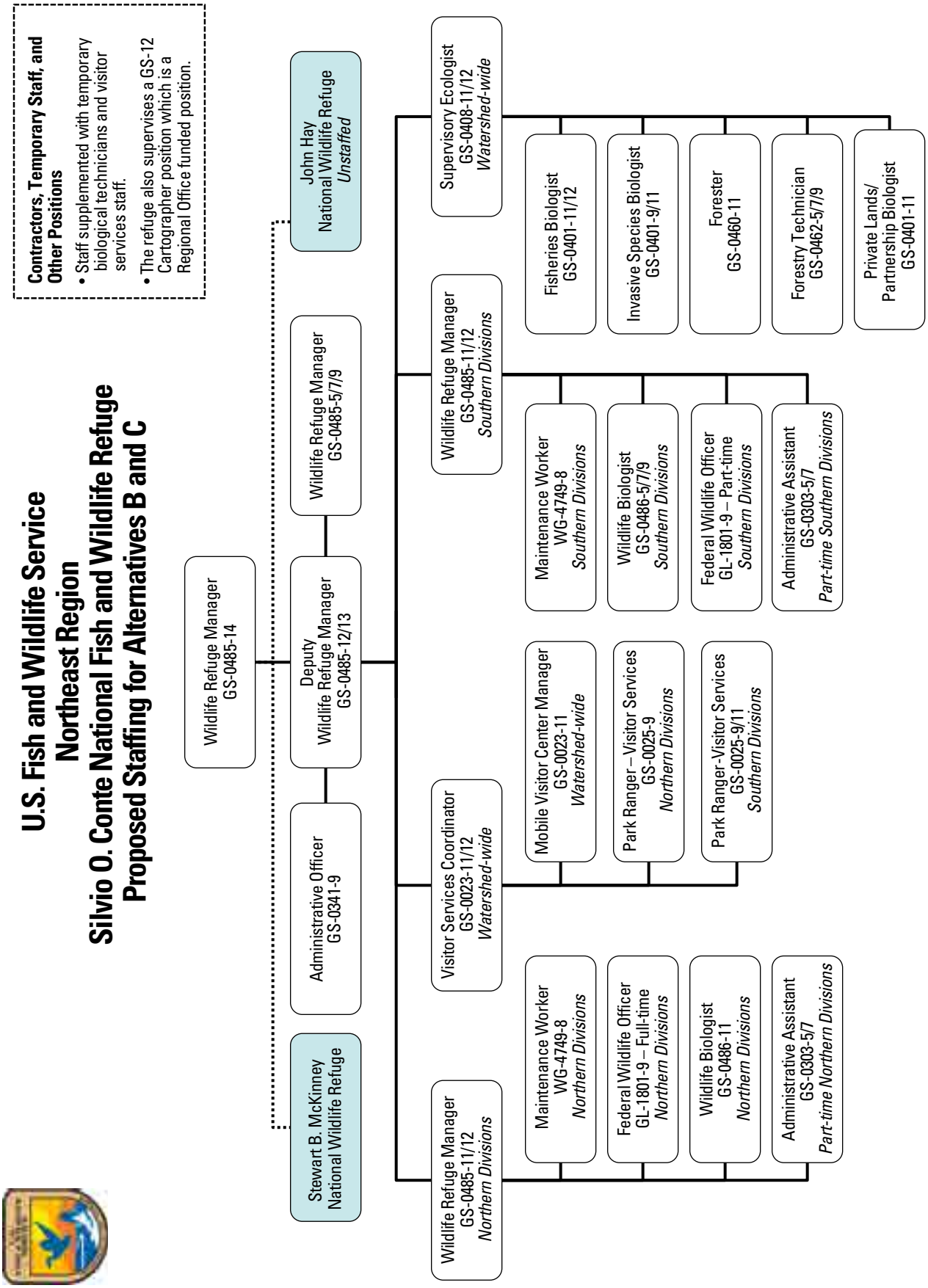
- **Alternative A—Current Staffing**
- **Proposed Staffing for Alternatives B and C**
- **Proposed Staffing for Alternative D**

# U.S. Fish and Wildlife Service
## Northeast Region
## Silvio O. Conte National Fish and Wildlife Refuge
## Alternative A — Current Staffing

**Contractors, Temporary Staff, and Other Positions**

- Staff supplemented with temporary biological technicians and visitor services staff.
- The refuge also supervises a GS-12 Cartographer position which is a Regional Office funded position.

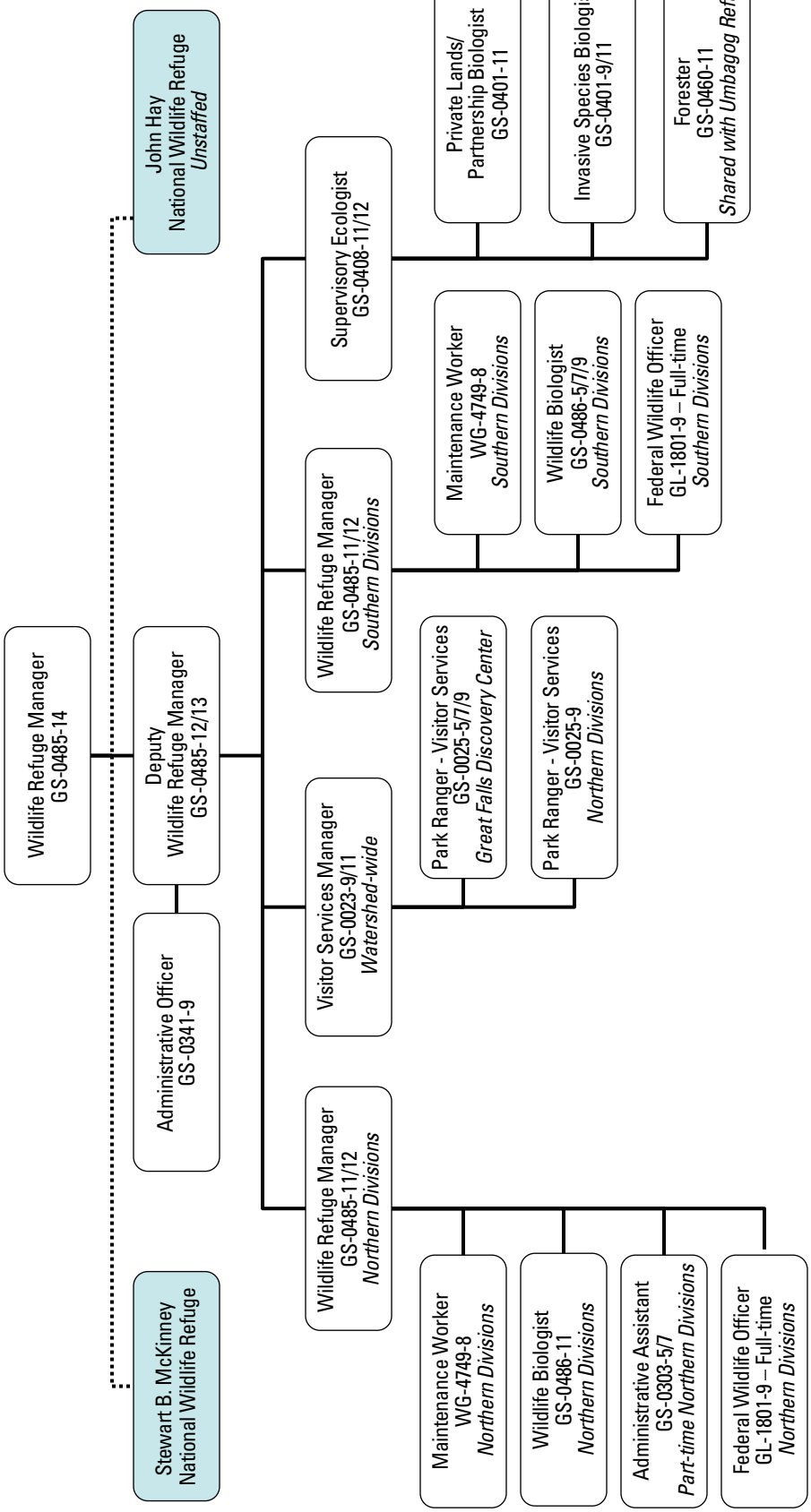



U.S. Fish and Wildlife Service
Northeast Region
Silvio O. Conte National Fish and Wildlife Refuge
Proposed Staffing for Alternatives B and C
Contractors, Temporary Staff, and Other Positions
• Staff supplemented with temporary biological technicians and visitor services staff.
• The refuge also supervises a GS-12 Cartographer position which is a Regional Office funded position.
Wildlife Refuge Manager GS-0485-14
Stewart B. McKinney National Wildlife Refuge
Administrative Officer GS-0341-9
Deputy Wildlife Refuge Manager GS-0485-12/13
John Hay National Wildlife Refuge Unstaffed
Wildlife Refuge Manager GS-0485-5/7/9
Wildlife Refuge Manager GS-0485-11/12 Northern Divisions
Maintenance Worker WG-4749-8 Northern Divisions
Federal Wildlife Officer GL-1801-9 – Full-time Northern Divisions
Wildlife Biologist GS-0486-11 Northern Divisions
Administrative Assistant GS-0303-5/7 Part-time Northern Divisions
Visitor Services Coordinator GS-0023-11/12 Watershed-wide
Mobile Visitor Center Manager GS-0023-11 Watershed-wide
Park Ranger – Visitor Services GS-0025-9 Northern Divisions
Park Ranger-Visitor Services GS-0025-9/11 Southern Divisions
Wildlife Refuge Manager GS-0485-11/12 Southern Divisions
Maintenance Worker WG-4749-8 Southern Divisions
Wildlife Biologist GS-0486-5/7/9 Southern Divisions
Federal Wildlife Officer GL-1801-9 – Part-time Southern Divisions
Administrative Assistant GS-0303-5/7 Part-time Southern Divisions
Supervisory Ecologist GS-0408-11/12 Watershed-wide
Fisheries Biologist GS-0401-11/12
Invasive Species Biologist GS-0401-9/11
Forester GS-0460-11
Forestry Technician GS-0462-5/7/9
Private Lands/ Partnership Biologist GS-0401-11

# U.S. Fish and Wildlife Service
## Northeast Region
## Silvio O. Conte National Fish and Wildlife Refuge
## Proposed Staffing for Alternative D

**Contractors, Temporary Staff, and Other Positions**

- Staff supplemented with temporary biological technicians and visitor services staff.
- The refuge also supervises a GS-12 Cartographer position which is a Regional Office funded position.



Appendix I

Dave Govatski

*Cherry Pond sunrise*

# U.S. Geological Survey Report: Economic Impacts of Current and Proposed Management Alternatives for the Silvio O. Conte National Fish and Wildlife Refuge

- Introduction
- Section I: Regional Economic Setting
- Section II: Current Trends, Objectives, and Potential Impacts of Land-Use Change
- Section III: Economic Impacts of Current and Proposed Management Activities
- Conclusion

Economic Impacts of Current and Proposed Management Alternatives for the Silvio O. Conte National Fish and Wildlife Refuge

By Elizabeth Donovan, William Gascoigne, and Catherine Cullinane Thomas

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*Fort Collins Science Center*
*Fort Collins, Colorado*

## Introduction

The National Wildlife Refuge System Improvement Act of 1997 requires all units of the National Wildlife Refuge System to be managed under a Comprehensive Conservation Plan (CCP). The CCP must describe the desired future conditions of a refuge and provide long range guidance and management direction to achieve refuge purposes. The Silvio O. Conte National Fish and Wildlife Refuge (Refuge), composed of land area within the borders of the Connecticut River Watershed (Watershed), is in the process of developing a range of management alternatives to present in the Refuge CCP and Environmental Impact Statement (CCP/EIS). Those alternatives will be based on refuge purposes, the proposed refuge vision and management goals, and issues that were raised by other agencies, partners, or the public. The CCP for the Refuge must contain an analysis of expected effects associated with current and proposed refuge management strategies. The purpose of this study was to estimate the regional economic impacts associated with the final CCP/EIS proposed management alternatives.

For refuge CCP planning, a regional economic impact analysis provides a means of estimating how current management compares to the other three proposed management alternatives and how they affect the local economy. This type of analysis provides two critical pieces of information: 1) it illustrates a refuge's contribution to the local community; and 2) it can help in determining whether local economic effects are or are not a real concern in choosing among management alternatives.

The regional impact analysis is composed of three separate sections. Section I of the report presents a description of the various regional economies and select local communities that comprise the Watershed and specific management areas for the Refuge. Section II is a qualitative discussion regarding the potential economic and fiscal impacts from additional land acquisitions. Section III first describes the methods used to conduct a regional economic impact analysis, followed by an analysis of the final CCP management strategies that could affect the local economy. The refuge management activities of economic concern in this analysis are:

- Refuge purchases of goods and services within the local communities,
- Refuge personnel salary spending,
- Spending in the local communities by refuge visitors,
- Revenues generated from timber harvesting on the refuge, and
- Refuge land purchases and changes in local tax revenue.

Additionally, it is important to note that the economic value of a refuge encompasses more than just the direct impacts to the regional economy. Refuges also provide substantial nonmarket values (values for items not exchanged in established markets) such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Caudill and Henderson, 2003). The natural 'services' provided by the conserved landscape can be extremely valuable to one's well-being and to society in a more traditional economic sense. For instance, forests and other undisturbed landscapes naturally filter and regulate water that often ends up in the public water supply. This natural process can minimize the economic burden on

municipalities to treat water in accordance with national water quality standards. Such was the case with New York City, who in the 1990's notably invested between $1 billion and $1.5 billion in conserving and preserving landscapes in the Catskill Watershed. This investment was calculated to produce cost savings of $6 billion-$8 over 10 years, when compared to the alternative of building and maintaining a new treatment facility (Chichilnisky and Heal, 1998). A 2008 study done by Ingraham and Foster attempts to value the bundle of ecosystem services provided by the USFWS National Wildlife Refuges in the contiguous U.S. The authors determined the various habitats within the refuge system were providing services valued at $32.3 billion (2011 dollars) per year, or an average of $2,900 per acre per year (Ingraham and Foster, 2008). As the New York City example and this study indicate, these ecosystem service values can be substantial, and should be recognized when evaluating Refuge strategies and goals. However, quantifying individual ecosystem service values is beyond the scope of the economic impact analysis.

## Section I: Regional Economic Setting

The Refuge was established in 1997 to conserve, protect, and enhance the abundance and diversity of native plant, fish, and wildlife species and the ecosystems on which they depend throughout the 7.2 million acre Watershed. The Watershed spans from the US/Canada border in the north down to where the Connecticut River meets the Atlantic Ocean below Long Island Sound. It incorporates large areas of Vermont, New Hampshire, Massachusetts, and Connecticut, including lands in 25 counties. The Refuge has three cooperatively managed visitor centers: at the Great Northwoods Interpretive Center in Colebrook, New Hampshire; at the Montshire Museum of Science in Norwich, Vermont; and Great Falls Discovery Center near in Turners Falls, Massachusetts. The Refuge currently consists of seven Units (small tracts) and two Divisions parcels (large tracts): 33 acres of wetlands and a riverine sand spit that hosts a federally-listed beetle in Cromwell, Connecticut; a 4 acre island in Deerfield, Massachusetts; 30 acres at the base of Mt. Toby in Sunderland, Massachusetts; an 18 acre upland and wetland parcel in Westfield, Massachusetts; 140 acres on Mt. Tom in Holyoke, Massachusetts; 20 acres along the Connecticut River in Greenfield, Massachusetts; 283 acres which host a federally endangered plant in Putney, Vermont; 3,670 acres surrounding the Audubon Society of New Hampshire's Pondicherry Refuge in Jefferson, New Hampshire; and 26,381 acres in the Nulhegan Basin in Essex County, Vermont.

The Watershed has been described as a, "rich mosaic of farmland, forests, and compact communities that is for many, the essence of New England life (TPL, 2011)." The river itself is 410 miles long—the longest in all of New England—and supports important fish and wildlife species, while providing 70 percent of Long Island Sound's freshwater (TPL, 2011). It is also 1 of only 14 rivers in the nation that have been designated as American Heritage Rivers (CTRW Council, 2011). The Watershed contains a great diversity of habitats; ranging from tidal salt marshes in the southern portion to mature spruce and hardwood forests in the north.

In its entirety, the Watershed encompasses an area of over 11,000 square miles and contains nearly 400 towns and cities. The waters of the Connecticut River have played an important role in the Watershed's social and economic history. The river itself provided a source of energy to power mills, factories, and entire communities, irrigation water for working farmlands, and a means of transportation for the watershed's people and goods. The regional economy has evolved from the original agricultural colonists and small goods traders, to robust manufacturing production and supporting commodity extraction industries, to relying more on the services sector and travel and tourism spending. Currently, large urban centers within the southern counties of the Watershed serve as hubs to the greater New York City area with many residents employed in the service industry. Counties near the northern headwaters continue to promote a more rural way of life and are still highly dependent on manufacturing jobs.

Many of the towns within the Watershed are attempting to capture more of the valuable tourism market by hosting annual festivals and cultural events that attract crowds from beyond the community borders. Many of these events are centered on the historic, cultural, and economic makeup of the region. Area farmers and artisans

are once again finding local markets for their goods, while catering to buyers and their overall experience. Agritourism seems to be expanding at a considerable rate, with each state in the Watershed now having a website and interactive map just for these enterprises.

There are abundant recreation opportunities within the counties of the Watershed, and specifically on much of the tracts under Refuge management. Traditional activities on Refuge lands include fishing, hunting, cross-country skiing, wildlife observation, photography, and environmental education. Snowmobiling is very popular in various regions of the Watershed, and is permitted on Refuge land where appropriate and compatible. The Appalachian Trail meanders through the northern portion of the watershed, making its way through the impressive White Mountain National Forest in New Hampshire. The middle portion of the Watershed in Massachusetts is bordered by the Berkshire Mountains to the west, which have been attracting tourists and recreationists for decades. Towns in the southern portion near the mouth of the Connecticut River heavily promote recreation opportunities associated with saltwater experiences. While large tracts of the Watershed remain undeveloped, sprawling communities, particularly in the southern portion of the watershed, have begun to alter the dynamics in the region.

Given the vastness of the Watershed and extensive diversity within, this regional profile of the economic impact analysis is subdivided into six focal sub-regions that are specific only to the regional profile report. The sub-regions incorporate 11 counties that make up the bulk of the Watershed and are central to the Refuge's proposed land Conservation Focus Areas (CFA). These being:

1. *Northern Sub-Region*: Essex County, Vermont and Coos Country, New Hampshire

2. *White River Junction Sub-Region*: Orange County, Vermont, Windsor County, Vermont, and Grafton County, New Hampshire

3. *Tri-State Border Sub-Region*: Windham County, Vermont, Cheshire County, New Hampshire, and Franklin County, Massachusetts

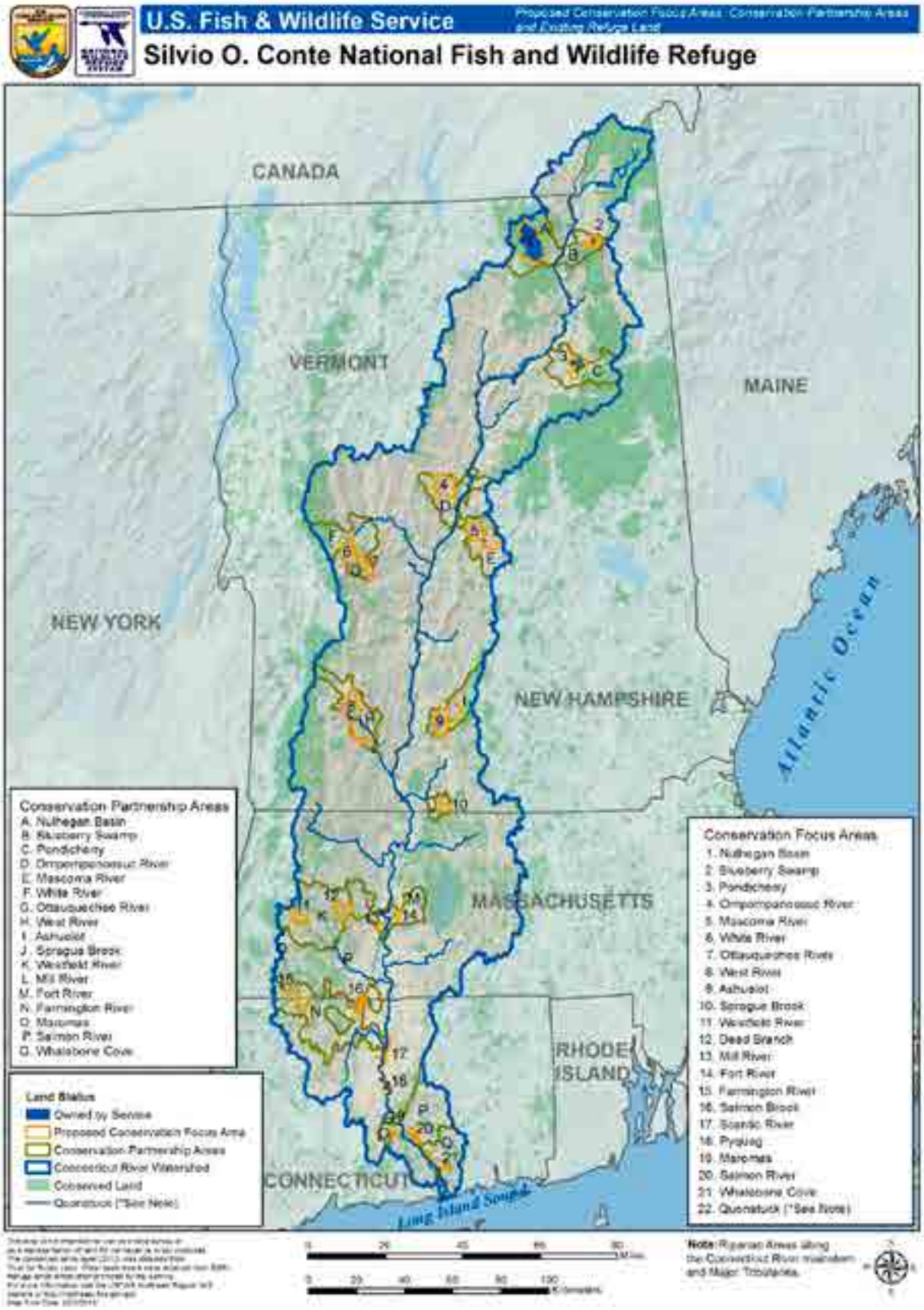
4. *Greater Amherst Sub-Region*: Hampshire County, Massachusetts

5. *Greater Hartford Sub-Region*: Hartford County, Connecticut

6. *Southern Connecticut Sub-Region*: Middlesex County, Connecticut.

Individual demographic profiles are provided for each focal sub-region. Each sub-region profile addresses historic and current trends in the area, and highlights important demographic and economic statistics. The sub-region profiles are presented in order from north to south, starting with the Northern Sub-Region and ending with the Southern Connecticut Sub-Region. A few additional towns were included in each sub-region profile. The towns of management interest were determined under future consideration assuming growth in the Refuge's land acquisition program. The towns were chosen given their proximity to existing Refuge lands and/or lands proposed for acquisition under Alternatives B, C, or D. These towns are likely to be impacted by management and acquisition proposals, and thought to have the current infrastructure necessary to harness new visitors, staff members, and additional Refuge non-salary spending.

**Figure I.1. Map of Silvio O. Conte Refuge.**



**Northern Sub-Region**

The Northern Sub-Region of the Watershed consists of Essex County, Vermont and Coos County, New Hampshire. Essex County, located in the northeast corner of Vermont, includes the Nulhegan Basin of the Refuge. The Nulhegan Basin Division recently built a new headquarters office and visitor contact station just outside of town of Island Pond, Vermont. The Basin is recognized for possessing high ecological values and is predominately forested with interspersed wetlands. Essex County maintains a rural way of life, with a density of only 10 people per square mile. The "Gateway to the Nulhegan Basin," the village of Island Pond is rich with history, recreation opportunities, and community involvement. Island Pond has shifted from being predominantly timber-dependent to an economy where timber and agricultural employment is very minor (U.S. Census Bureau, 2009). Once a major railway junction and destination for timber industry leaders, the grand houses in the area are said to reflect the wealth of another era (Northeast Kingdom Travel and Tourism Association, Accessed August, 2011).

Coos County makes up the northern tip of New Hampshire and is also the least populated county in the state, despite being the largest in terms of land area. The county is home to both the Mohawk River and Pondicherry Divisions of the Refuge, and encompasses most of the northern portion of the White Mountains. The Mohawk River Division is located near Colebrook, New Hampshire, which is the location for the Great Northwoods Interpretive Center. This site is a rest area and information center that is run by the New Hampshire Department of Transportation. The Pondicherry Division is located near the towns of Whitefield, New Hampshire and Lancaster, New Hampshire. Colebrook, Lancaster and Whitefield have a deep history in New England's railroad system. The towns also lend themselves to outdoor enthusiasts eager to brave the cold in the winter, or enjoy the temperate conditions of the summer.

**Population**

Table I.1 gives the population estimates and trends for Vermont and New Hampshire, the two Northern Sub-Region counties, and the four towns of management interest. From 2000 to 2010, New Hampshire's overall population saw an increase of 6.5 percent, while Coos was the only county in the state to report a decline in population (0.2 percent) during that same time period. Similarly, Vermont experienced steady growth over the last decade, while Essex was one of only three counties in the state to report a decline in population. The 2010 population of 6,306 makes Essex County the least populous county in the state of Vermont and all of New England. Looking at Figure I.2, the population in the two-county sub-region has been declining over the last two decades, with elevated rates of decline observed in recent years. Based on population forecasts from respective state departments, these county population trends are expected to level out over the next decade, with very minor growth by 2020. While Coos County documents a population over five times that of Essex, they both retain a population density under twenty residents per square mile—the lowest concentrations in the entire Watershed.

**Table I.1. Population Figures for Northern Sub-Region**

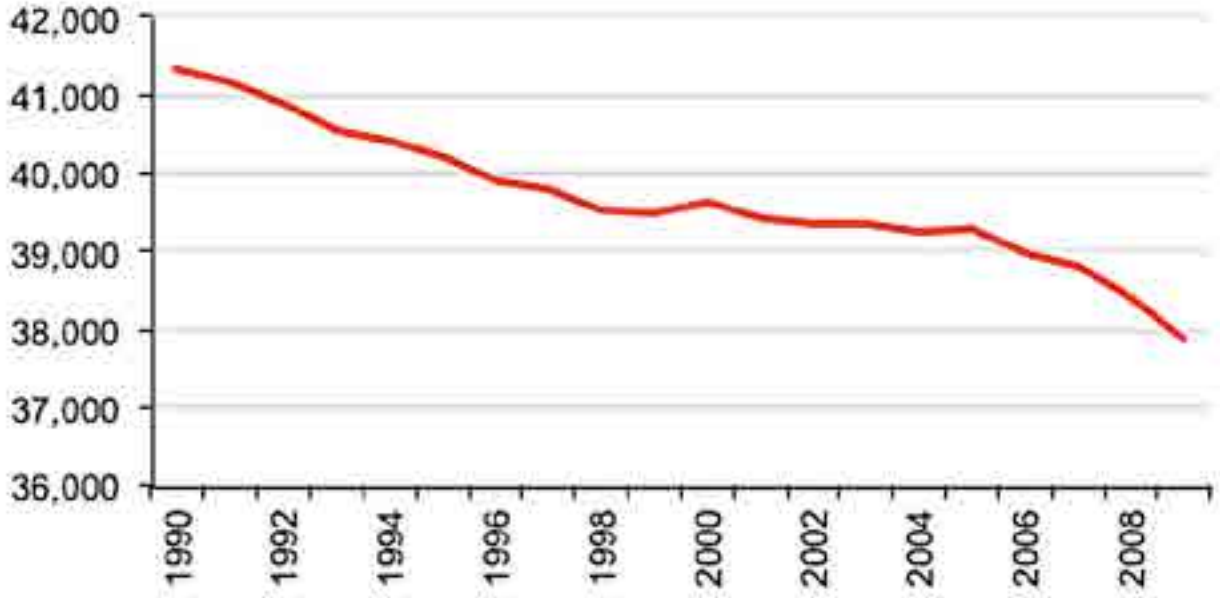
| Northern Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Vermont | 625,741 | 40 | 68 | 9,250 | 2.8 | 638,809 |
| New Hampshire | 1,316,470 | 39 | 147 | 8,968 | 6.5 | 1,470,000 |
| Essex County (VT) | 6,306 | 43.9 | 10 | 674 | -2.4 | 6,318 |
| Coos County (NH) | 33,055 | 45.1 | 18 | 1,831 | -0.2 | 33,369 |
| *Towns of Interest* | | | | | | |
| Island Pond, VT | 723 | 46.8 | 161 | 4.5 | -14.8 | N/A |
| Colebrook, NH | 2,141 | 45.4 | 52 | 41.0 | -7.8 | N/A |
| Lancaster, NH | 3,264 | 37.1 | 64 | 51.0 | -0.5 | N/A |
| Whitefield, NH | 2,125 | 47.5 | 61 | 34.7 | 4.1 | N/A |

*Source: U.S. Census Bureau, 2010; New Hampshire Office of Energy and Planning, 2006; Vermont DOL, 2010a. *Note: Resident populations and median age estimates for Towns of Interest were pulled from U.S. Census Bureau's 2005-2009 American Survey 5-year Estimates.*

Island Pond, Vermont is a census-designated place within the larger town of Brighton, Vermont. Together, they have a population that is still under 2,000 residents. When compared to 2000 U.S. Census data, this area has experienced the largest decreases in overall population out of the four towns in the Northern Sub-Region profile. In contrast to the other three towns in the analysis, Whitefield, New Hampshire experienced moderate amounts of growth over the last decade.

The median age of the population within the two northern states has been increasing slightly as the post-war baby boom generation continues to age (New Hampshire Office of Energy and Planning, 2006). Both Essex and Coos County report higher median ages than respective state-wide estimates. The median age in the towns of Island Pond, Colebrook, and Whitefield all are above that of their respective counties.

**Figure I.2. Population Trends for Northern Sub-Region, 1990-2008**




*Source: U.S. Department of Commerce, BEA, 2011a.*

In 2010, the U.S. population consisted of 63.7 percent of white persons not of Hispanic or Latino origin (U.S. Census Bureau, 2010). Comparatively, Vermont's resident population consisted of 94.3 percent, which currently ranks it as having the second highest proportion of white persons in the nation. New Hampshire shares a similar racial makeup, with 92.3 percent of the population designated as white people not of Hispanic or Latino origin. Essex and Coos County retain ethnicity proportions even higher than their respective state averages, with both at around 96 percent. These proportions are the highest out of the eleven counties included in the Watershed profile. Nearly 95 percent of the residents in the two Northern Sub-Region counties were born in the U.S. In both Essex and Coos County, around 84 percent of residents over the age of twenty-four are high school graduates and 16 percent have earned a bachelor's or advanced degree (U.S. Census Bureau, ACS, 2009). Comparatively, 90 percent of the state-wide population for New Hampshire and Vermont has graduated from high school, and 32 percent have received advanced degrees.

**Regional Employment and Income**

The Northern Sub-Region maintains a rural way of life that has personal and professional ties to its residents. While natural commodity industries have a longstanding presence in the area, the service sector and tourism industry continue to expand. Many of the local economies within the Northern Sub-Region are said to be at an "inflection point," in which they are losing traditional manufacturing jobs and gaining new ones through increased tourism and recreation (New Hampshire Office of Energy and Planning, 2006). According to the North East

State Foresters Association, the value of forest-based manufacturing shipments made up almost 64 percent of annual revenues from New Hampshire's forest in 2001. By 2005, the share of those revenues had dropped to just over 53 percent. Forest-related recreation and tourism had contributed about 36 percent of the revenues in 2001 and grew to over 46 percent in the same time period (NEFA, 2007). Table I.2 gives median household income, unemployment rates, and the percent of the population living in poverty for Vermont and New Hampshire, the two Northern Sub-Region counties, and four communities of interest.

**Table I.2. Income, Employment, and Poverty Rates in the Northern Sub-Region**

| | Median Household Income (2009 $s) | Percent Unemployed | | | Percent below Poverty (2009) |
|---|---|---|---|---|---|
| | | 2000 | 2009* | 2010* | |
| US | 50,221 | 4.0 | 9.9 | 9.4 | 14.3 |
| Vermont | 51,284 | 2.7 | 6.6 | 5.6 | 11.5 |
| New Hampshire | 63,033 | 2.7 | 6.4 | 5.3 | 8.6 |
| ***Northern Sub-Region*** | | | | | |
| Essex County (VT) | 40,046 | 3.7 | 10.9 | 7.9 | 16.9 |
| Coos County (NH) | 42,786 | 3.7 | 9.1 | 8.4 | 14.5 |
| ***Towns of Interest*** | | | | | |
| Island Pond, VT | 22,019 | 5.1 | N/A | N/A | N/A |
| Colebrook, NH | 29,643 | 3.1 | N/A | 8.9** | N/A |
| Lancaster, NH | 53,292 | 2.7 | 7.1 | 5.6** | N/A |
| Whitefield, NH | 39,211 | 3.5 | N/A | 7.0** | N/A |

*Source: U.S. Bureau of Labor Statistics, 2011; U.S Census Bureau, ACS, 2009; U.S. Census Bureau Quickfacts, 2009; New Hampshire ELMIB, 2010; Vermont DOL, 2010b; (*) Denotes unemployment rates as of December of that year; (**) Denotes estimates made using the Wolfram Alpha Computational Knowledge Engine, 2011.*

Median household income in 2009 for Essex County, Vermont was $40,046, which is the lowest in the entire Watershed and more than $10,000 lower than the Vermont state median. The median household income in Coos County of $42,786 is slightly higher; however it is more than $20,000 less than the New Hampshire state average. Unemployment figures are presented in Table I.2 for the years 2000, 2009, and 2010, given the recent recession and economic volatility. All counties within the Watershed experienced unemployment levels under 4 percent at the start of the decade. However, by 2009 unemployment rates were above 9 percent in both Northern Sub-Region counties, with Essex County reaching the highest level of unemployment at 10.9 percent. While Essex and Coos County continue to experience relatively high unemployment, rates in both counties were on the decline by the end of 2010. The percentage of the population in Coos and Essex County living below the poverty line in 2009 was slightly greater than the national average (14.3) and were the two highest rates out of the eleven counties included in the larger Watershed profile. Unemployment rates for the four selected communities of interest are on par with those at the county level. As of December, 2010, the town of Lancaster, New Hampshire maintained the lowest rate of unemployment, at 5.6 percent.

Table I.3 gives the employment breakdown by industry for the counties in the Northern Sub-Region. The largest employer in both counties is the education services, health care and social assistance sector, which accounts for more than 20 percent of total employment. The manufacturing and retail sectors round out the top three, respectively. The percent of the total workforce employed in the manufacturing and retail industries in Essex and Coos County are the highest among all counties within the Watershed.

**Table I.3. Employment by Industry in Northern Sub-Region Counties**

| Full-Time and Part-Time Employment | Northern Sub-Region | |
|---|---|---|
| | Essex County | Coos County |
| Civilian employed pop. (16 years and over) | 3,107 | 15,369 |
| ***Percent of Employment by Industry*** | | |
| Agriculture, forestry, fishing and hunting, and mining | 4.4 | 2.9 |
| Construction | 8.6 | 8.7 |
| Manufacturing | 18.3 | 13.6 |
| Wholesale trade | 0.7 | 1.6 |
| Retail trade | 14.7 | 12.7 |
| Transportation and warehousing, and utilities | 5.4 | 4 |
| Information | 1.2 | 1.6 |
| Finance and insurance, and real estate | 2.7 | 4.3 |
| Professional, scientific, and management, admin. and waste mgmt. Services | 4.4 | 4.5 |
| Education services, health care, and social assistance | 22.9 | 24.5 |
| Arts, entertainment, and recreation, and accommodation and food services | 6.7 | 12 |
| Other services, except public administration | 3.9 | 4.5 |
| Public administration | 6.1 | 5.1 |

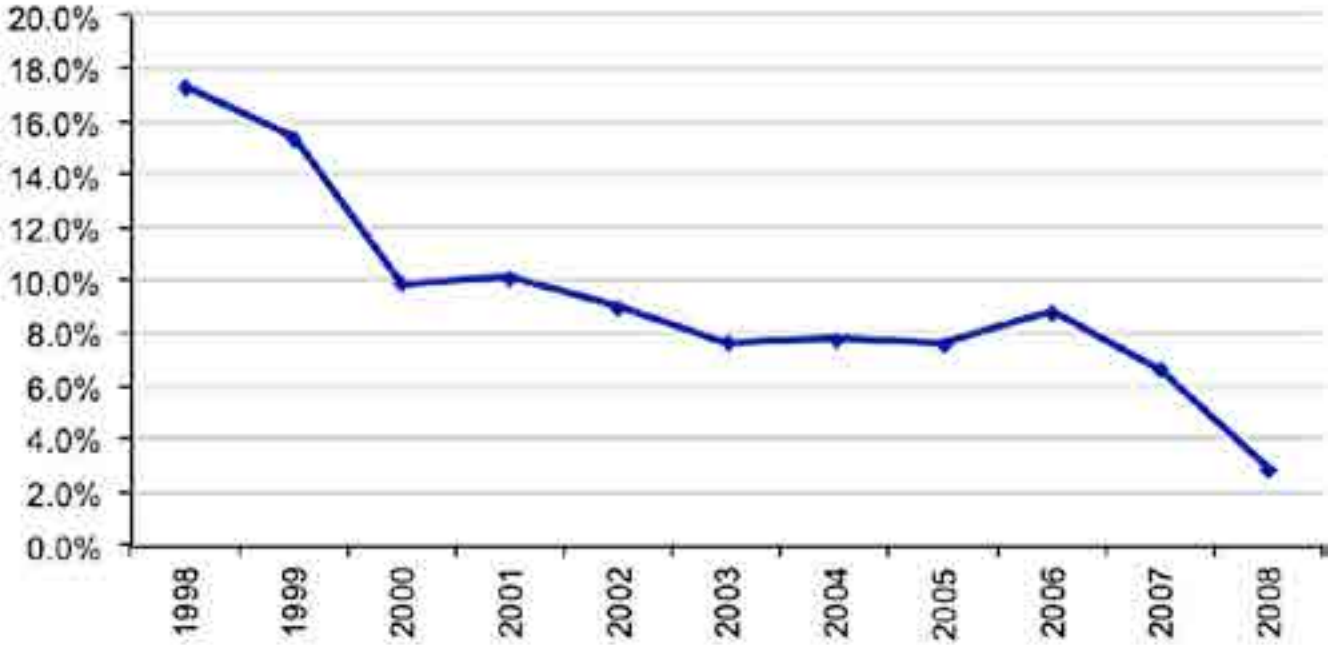
*Source: U.S. Census, ACS, 2009.*

**Commodity Industries**

*Timber*

There is a long standing history of timber harvesting in the Watershed, especially in the northern states of Vermont and New Hampshire. Huge log drives down the Connecticut River remain iconic images of the region and its residents. The expansive timber production in the area gave way to timber-related industries, such as saw mills, pulp/paper mills, and wood-product manufacturers. However, these once dominant industries have been in sharp decline. In 1998, timber-related jobs represented 17.3 percent of total employment in the two-county Northern Sub-Region. By 2008, this figure was down to 2.9 percent (see Figure I.3). The total number of timber-related jobs in the Northern Sub-Region is estimated at under 600, including both private employment and independent proprietors (U.S. Dept of Commerce, 2010a,b). This industry has especially been hit hard in Coos County in recent years. There has been the closure of the Groveton Paperboard mill in March 2006, leaving 108 workers unemployed, then two months later Fraser Paper closed their pulp mill within the county, affecting another 250 area workers, and again with the December 2007 closure of the Wausau Paper Mill that employed 303 people (New Hampshire ELMIB, 2007).

**Figure I.3. Percent of Total Private Employment in Timber Industries, Northern Sub-Region**




*Source: U.S. Dept. of Commerce, Census Bureau. 2010a*

In 2009, 1.17 million cords of wood were harvested in New Hampshire forests (NEFA, 2011). This is a significant reduction from 2005 levels, which is consistent with the economic recession. In 2009, New Hampshire private landowners received over $30 million from timber sales, and forest-based manufacturing's estimated contribution to the state's economy was $1.15 billion in output, 8,160 jobs, and a payroll of around $384 million per year to the state's economy (NEFA, 2011). In 2005, Vermont forest-based manufacturing was estimated to have contributed nearly $1.0 billion in value of shipments to the economy, or 9.3 percent of the state's total manufacturing sales (NEFA, 2007).

*Agriculture*

Each of the counties and towns of interest in the Northern Sub-Region have historic ties to agriculture and both Vermont and New Hampshire continue to embrace investment in their state's agriculture sector. In the summer of 2011, Governor Shumlin of Vermont introduced the newly enacted House Bill 287 that creates a grant program for area producers and processing facilities, which is engineered to sustain and grow jobs in agriculture. The Bill begins the process of addressing barriers and opportunities identified through Vermont's Farm to Plate Strategic Plan—a 10-year plan to strengthen the state's food system. The Farm to Plate Strategic Plan currently estimates Vermont's food system generates $2.7 billion annually in total economic output, employing over 55,500 people at nearly 11,000 private sector businesses across the state (Vermont Sustainable Jobs Fund, 2011). The New Hampshire Department of Agriculture (among others) recently funded a similar research effort looking into the economic contribution of their food system. The report titled, "Home Grown," estimates New Hampshire's local food system—including local agriculture (e.g. farming), food manufacturing, food support services (e.g. food distributors), and food retailers (e.g. supermarkets and restaurants)—annually contributes $3.3 billion in gross state product, or 5.7 percent of New Hampshire's $58 billion economy (Magnusson et al, 2010).

Table I.4 gives the number of farming operations, farm size, acres of farmland, and the value of agricultural products produced in New Hampshire and Vermont and each of the focal counties in the sub-region, while Figure 4 graphically displays employment in natural commodity industries for Coos and Essex Counties, the county region and the US. The state of Vermont has more than double the amount of farmland acreage than any of the other three states in the Watershed, with a commodity market value of around $670 million per year. Essex County experienced a substantial increase (35 percent) in its farmland acres from 2002-2007. This growth is the largest percent increase out of any county in the Watershed. USDA Census data also reveals the number of agricultural enterprises in New Hampshire increased by over 800 during that time period. Coos County, similar to the other two New Hampshire counties included in the larger Watershed profile, experienced a 15 percent increase in farmland acreage compared to 2002 figures.

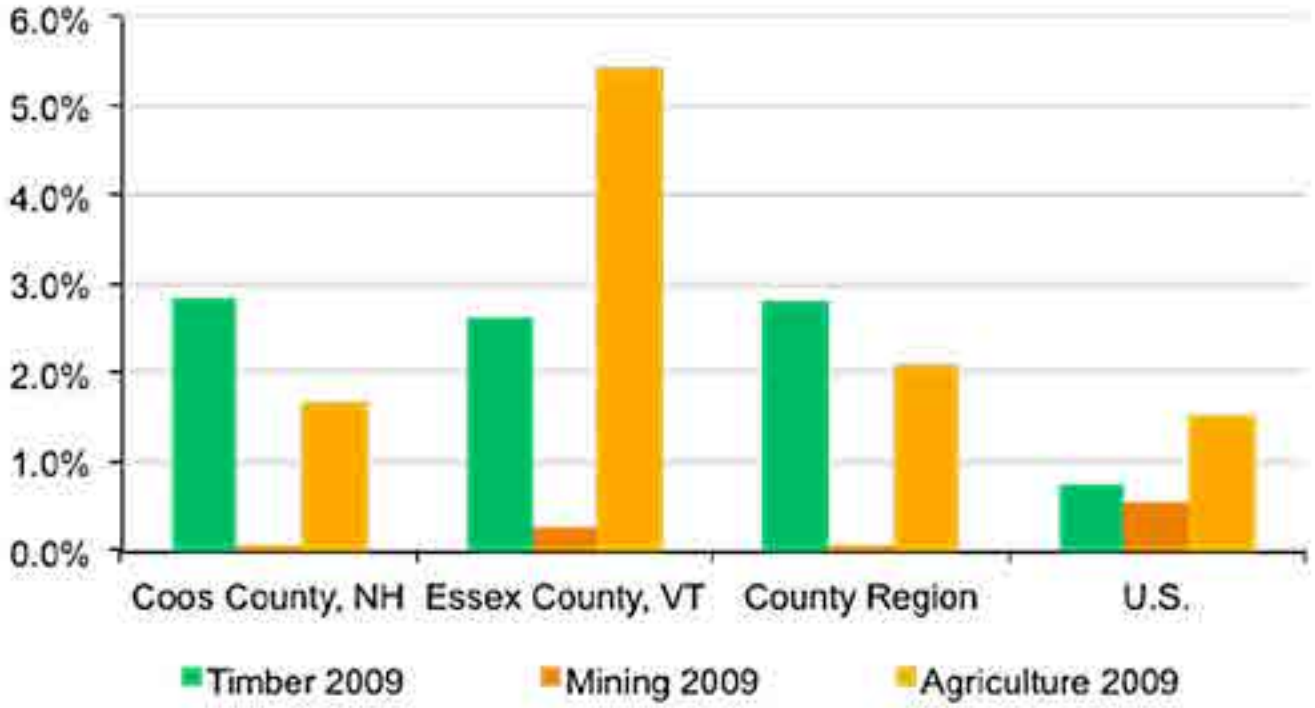
**Table I.4. Farming in the Northern Sub-Region**

| Agriculture in the Northern Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Vermont | 6,984 | 177 | 1,233,313 | -0.93 | 673,713,000 |
| New Hampshire | 4,166 | 113 | 471,911 | 6.08 | 199,051,000 |
| Essex County (VT) | 94 | 284 | 26,732 | 34.75 | 12,147,000 |
| Coos County (NH) | 262 | 194 | 50,895 | 15.44 | 13,003,000 |

*Source: USDA, Ag. Census. 2002, 2007.*

While farmland statistics are not provided at the community level, there is a farming history within the communities of interest. Colebrook, New Hampshire was known historically for its excellent soil, and was even titled the "Potato Capital of New Hampshire" in the 1874 Gazetter. Lancaster, New Hampshire shared similar notoriety, helping supply area mills and railroad stations with grains and starches. While this industry and accompanying employment is nowhere near its historic levels, these communities continue to embrace their farming heritage.

**Figure I.4. Commodity Industries in Northern Sub-Region, Percent of Total Employment.**




*Source: U.S. Dept. of Commerce, BEA. 2011b.*

* Note data for timber and mining are from County Business Patterns which excludes proprietors, government, and railroad. Data for agriculture are from Bureau of Economic Analysis. The latest year for each data source may vary due to different data release schedules.

**Recreation and Tourism-Related Industries**

The travel and tourism industry continues to be a significant and growing contributor to the local and regional economies within the Watershed. Total direct spending from annual travel and tourism in the northern states of Vermont and New Hampshire is estimated at nearly $6 billion; this spending supports nearly 12 percent of the total workforce in Vermont (Economic & Resources Policy, Inc., 2007; Goss, 2011). The growing tourism industry in Coos County has been supported by the natural beauty of the area and access to public lands for recreating, including a National Forest, designated wilderness, and various state parks within the county's boundaries.

Recreation activities occurring on lands under Refuge management include hunting, fishing, snowmobiling, canoeing, photography, and wildlife viewing. Other popular recreation activities that bring large amounts of visitors to the area include downhill and cross-country skiing. Details about the economic contribution associated with wildlife viewing, hunting, and fishing in Vermont and New Hampshire are provided in Table I.5.

**Table I.5. Recreation Estimates and Expenditures in Vermont and New Hampshire**

| Recreation Estimates | Residents and Non-Residents | Vermont | New Hampshire |
|---|---|---|---|
| Fishing | # of Anglers | 114,000 | 230,000 |
| | Total Expenditures | 63,749,000 | 172,413,000 |
| | Trip-Related | 40,535,000 | 88,581,000 |
| | Equipment and Other ($) | 23,214,000 | 83,832,000 |
| Hunting | # of Hunters | 73,000 | 61,000 |
| | Total Expenditures | 189,707,000 | 74,467,000 |
| | Trip-Related | 20,928,000 | 17,665,000 |
| | Equipment and Other ($) | 168,779,000 | 56,802,000 |
| Wildlife Watching | Total Participants | 468,000 | 710,000 |
| | Total Expenditures | 122,841,000 | 273,769,000 |
| | Trip-Related | 58,219,000 | 116,136,000 |
| | Equipment and Other ($) | 64,622,000 | 157,633,000 |

*Source: USFWS National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 2006.*

**Land Use and Ownership**

The two-county Northern Sub-Region is about 90 percent forested (NASA MODIS, 2006). In 2000, estimated residential land accounted for 11.1 percent of the total land area in Essex County, Vermont and 13.6 percent of the total land area in Coos County, New Hampshire. These residential percentages are almost entirely classified as 'exurban,' in which average lot sizes are between 1.7 and 40 acres (Headwaters Economics EPS-HDT Toolkit and Report, 2011). While these percentages are the smallest in the entire Watershed, they represent a 36 percent and 20.4 percent increase from 1980 and 2000, respectively (Theobald, 2005). Coos County is made up of roughly 20 percent federal lands, while Essex County contains less than 7 percent federal lands. Table I.6 reveals the breakdown of landownership for the two counties.

**Table I.6. Land Ownership (acres) in the Northern Sub-Region**

| | Coos County, NH | Essex County, VT | County Region |
|---|---|---|---|
| Total Area | 1,170,136 | 430,700 | 1,600,836 |
| Private Lands | 857,822 | 315,768 | 1,173,590 |
| Federal Lands | 244,255 | 28,159 | 272,414 |
| State Lands | 55,479 | 84,372 | 139,851 |
| City, County, Other | 12,580 | 2,402 | 14,982 |

*Source: Conservation Biology Institute, 2006, 2008 (As cited by Headwater Economics EPS-HDT, 2011).*

In a 2008 real estate transaction, the Plum Creek Timber Co. purchased an expansive 86,212 acre land track that covers parts of 14 towns in Essex County. Before this sale, the state of Vermont and Freeman Foundation purchased easements on this property to guarantee traditional uses of the land for logging and recreation (Sutkowski, 2008).

To date, the Refuge has acquired and conserved just over 35,000 acres throughout the Watershed, almost exclusively through fee-acquisitions. The largest conserved land tract—26,381 acres—is found in the Nulhegan Basin located in Essex County, Vermont. The Refuge currently owns approximately 7,200 acres in Coos County, New Hampshire. Additional lands in the riparian area along the Connecticut River, as well as adjoining lands near the present Divisions, have been identified for their high ecological value and potential acquisition. For a comprehensive discussion on the Refuge's land acquisition program and the potential economic impacts of federal fee acquisitions and conservation easements, please reference Section II.

### White River Junction Sub-Region

The White River Junction (WRJ) Sub-Region of the Watershed consists of Orange County, Vermont, Windsor County, Vermont, and Grafton County, New Hampshire. The sub-region is located in the middle portion of Vermont and New Hampshire's co-boundary. The area houses the Refuge's cooperatively managed Montshire Museum of Science in Norwich, Vermont. The Montshire Museum has gained tremendous notoriety in the northeast and beyond, and now typically sees 150,000 visitors each year. Windsor County is the largest county in the state in terms of land area (U.S. Census Bureau, 2010). Grafton County is home to two large colleges and has been rated as a great rural place to live (Progressive Farmer, 2006). The county cites low unemployment (despite relatively slow economic growth), favorable cost of living, and accessibility the White Mountain National Forest (Grafton County Economic Development Council, 2011). The Dartmouth Hitchcock Medical Center and four other local hospitals, along with supporting medical firms, have had a strong influence on employment (UNH Cooperative Extension, 2010). These favorable traits have helped lead to one of the largest population increases (in percentage terms) found within the entire Watershed.

Four communities are also highlighted in the WRJ Sub-Region profile. These being: Bradford, Vermont; Woodstock, Vermont; Hanover, New Hampshire; and Lebanon, New Hampshire. Bradford is a relatively small Vermont town that is dissected by many rivers and streams that are tributaries to the larger Connecticut River. These sources of water provided the foundation for farming, milling, and manufacturing to take root early in the town's history. Today, the town relies on the adjacent water sources and natural beauty of the area to attract visitors year-round. The other three towns in the profile lie further south, with Woodstock the furthest west. Woodstock is a quintessential New England town with beautiful Colonial homes and churches, a quaint main street supporting small-scale shops and bread and breakfast establishments, and is dissected with a free-stone river that is dotted with wooden covered bridges. Hanover and Lebanon are larger communities located near the state border in New Hampshire and continue to experience population growth. They are largely dependent on the prestigious Dartmouth College and its various campuses and centers for both employment and as a market for local goods and services.

#### Population

Table I.7 gives the population estimates and trends for Vermont and New Hampshire, the three WRJ Sub-Region counties, and the four towns of interest. Over the last decade, New Hampshire's overall population increased by 6.5 percent. Vermont experienced more moderate growth, documenting close to a 3 percent increase in the state's total population during the same time period. The two-county sub-region experienced steady growth throughout the 1990's, yet has been tapering off for most of the 2000s (see Figure I.5). The population growth observed in Grafton County, New Hampshire (9 percent) exceeds that of the state. Orange County's growth rate over the last ten years is in line with that of Vermont's, while Windsor County's population shrunk by 1.3 percent. The 2010 population of 28,936 in Orange County, Vermont makes it the least populated County in the WRJ Sub-Region. However, the population densities across the three counties are fairly similar. Population densities ranging from 42-58 people per square mile reveal the rural character of the WRJ Sub-Region. Population trends for New Hampshire and Vermont, and the three counties included sub-region profile, are expected to continue over the next decade.

**Table I.7. Population Figures for WRJ Sub-Region**

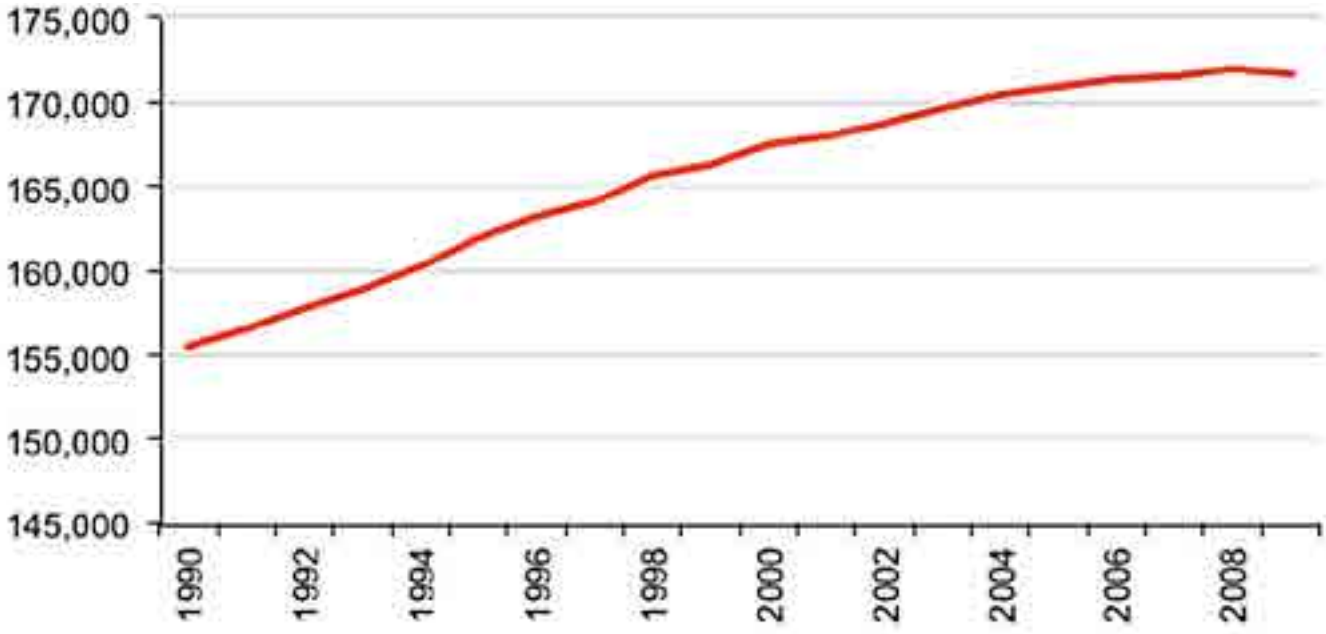
| White River Junctio Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Vermont | 625,741 | 40.6 | 68 | 9,250 | 2.8 | 638,809 |
| New Hampshire | 1,316,470 | 39.6 | 147 | 8,968 | 6.5 | 1,470,000 |
| Orange County (VT) | 28,936 | 42.3 | 42 | 692 | 2.5 | 29,730 |

| White River Junctio Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Windsor County (VT) | 56,670 | 44.5 | 58 | 971 | -1.3 | 55,515 |
| Grafton County (NH) | 89,118 | 39.6 | 51 | 1,750 | 9.0 | 95,109 |
| Towns of Interest | | | | | | |
| Bradford, VT | 2,663 | 49.5 | 89 | 29.9 | 1.7 | N/A |
| Woodstock, VT | 3,148 | 47.9 | 71 | 44.6 | -2.6 | N/A |
| Hanover, NH | 11,098 | 21.9 | 221 | 50.2 | 2.2 | N/A |
| Lebanon, NH | 12,762 | 36.9 | 308 | 41.4 | 1.5 | N/A |

*Source: U.S. Census Bureau, 2010; New Hampshire Office of Energy and Planning, 2006; Vermont DOL, 2010a. *Note: Resident population and median age estimates for Towns of Interest were pulled from U.S. Census Bureau's 2005-2009 American Community Survey 5-yr. Estimates.*

The two Vermont towns in the profile (Bradford and Woodstock) both have populations lower than 3,500 and median ages above 47. They are in more rural areas of the Watershed. Hanover and Lebanon, on the other hand, both have populations above 11,000 and median ages below 40, with Hanover reporting a median age of 21.9 years old (U.S. Census Bureau, ACS, 2009). This statistic is reflective of the significant local student population in the area. Hanover and Lebanon reported population growth of 2.2 percent and 1.5 percent, respectively. This continued growth has been aided by the presence of Dartmouth College and many of the supporting firms in the area (UNH Cooperative Extension, 2010).

**Figure I.5. Population Trends for the WRJ Sub-Region, 1990-2008**




*Source: U.S. Department of Commerce, BEA, 2011a.*

In 2010, the U.S. population consisted of 63.7 percent of white persons not of Hispanic or Latino origin (U.S. Census Bureau, 2010). Comparatively, Vermont's resident population consisted of 94.3 percent, which currently ranks it as having the second highest proportion of white persons in the nation. New Hampshire shares a similar

racial makeup, with 92.3 percent of the population designated as white people not of Hispanic or Latino origin. This is the same percentage recorded at the county-level for Grafton, New Hampshire. Orange and Windsor Counties in Vermont each have percentages of white persons around 95 percent. Close to 96 percent of residents in each of the three WRJ Sub-Region counties were born in the U.S. The two states and three sub-region counties all document around 90 percent of their respective populations over the age of twenty-four having a high school degree, and between 28 to 34 percent having earned a bachelor's or advanced degree (U.S. Census Bureau, ACS, 2009).

**Regional Employment and Income**

The WRJ Sub-Region maintains a rural way of life. Natural commodity industries have a longstanding presence in the area, yet their dominance continues to decline. Concurrently, the service sector and tourism industry continue to expand (U.S. Census Bureau, ACS, 2009). Table I.8 displays the median household income, unemployment rates, and percentages of those living in poverty for the WRJ Sub-Region counties, communities of interest, and their respective states.

**Table I.8. Income, Unemployment, and Poverty Rates in the WRJ Sub-Region**

| | Median Household Income (2009 $'s) | Percent Unemployed | | | Percent below Poverty (2009) |
|---|---|---|---|---|---|
| | | 2000 | 2009* | 2010* | |
| US | 50,221 | 4.0 | 9.9 | 9.4 | 14.3 |
| Vermont | 51,284 | 2.7 | 6.6 | 5.6 | 11.5 |
| New Hampshire | 63,033 | 2.7 | 6.4 | 5.3 | 8.6 |
| Orange County (VT) | 51,011 | 2.2 | 6.2 | 5.5 | 10.8 |
| Windsor County (VT) | 51,066 | 2.1 | 5.9 | 5.2 | 10.5 |
| Grafton County (NH) | 52,691 | 2.4 | 5.5 | 4.2 | 10.3 |
| *Towns of Interest* | | | | | |
| Bradford, VT | 51,071 | 2.9 | 8.1 | 7.1 | N/A |
| Woodstock, VT | 76,184 | 2.0 | 5.3 | 4.9 | N/A |
| Hanover, NH | 99,053 | 2.4 | 3.4 | 2.3 | N/A |
| Lebanon, NH | 57,982 | 1.7 | 4.2 | 2.9 | N/A |

*Source: U.S. Bureau of Labor Statistics, 2011; U.S. Census Bureau, ACS, 2009; U.S Census Quickfacts, 2009; New Hampshire ELMIB, 2010; Vermont DOL, 2010b. (*) Denotes unemployment rates as of December of that year.*

The 2009 Median household income in Vermont was on par with the national median of $50,221, as were the two Vermont counties included in the sub-region profile. In contrast, the state of New Hampshire reported a median household income of $63,033. This state-wide figure is more than $10,000 higher than that recorded in Grafton County, New Hampshire. The town of Hanover in Grafton County however, reported one of the highest median incomes in the Watershed at $99,053. One can infer that Dartmouth professors, administrators or others associated with the prestigious school contribute heavily to this figure. Unemployment figures are presented in Table I.8 for the years 2000, 2009, 2010 given the recent volatility in the economy. The three counties in the WRJ Sub-Region have documented unemployment figures below the New Hampshire and Vermont state averages since 2000. In late 2010, unemployment figures in the three counties were nearly 4 percent lower than the national

average. The four towns of management interest also had unemployment rates below 3 percent in the year 2000. Bradford, Vermont experienced the highest spike in unemployment at the height of the recession in late 2009 at just over 8 percent. Unemployment rates in each of the four towns were on the decline by the end of 2010. The towns of Hanover and Lebanon currently maintain the lowest unemployment rates out of any town examined in the larger Watershed profile.

Table I.9 gives the employment breakdown by industry for the counties in the WRJ Sub-Region. The largest employer in each of the three counties is the educational services, and health care and social assistance industry; accounting for more than 30 percent in Orange and Grafton Counties, and 25 percent in Windsor County. The second largest employer for all three counties is the retail trade industry, ranging from 10 to 13 percent.

**Table I.9. Regional Employment by Sector in the WRJ Sub-Region**

| Full-Time and Part-Time Employment for White River Junction Sub-Region by Industry | WRJ Sub-Region | | |
|---|---|---|---|
| | Orange County | Windsor County | Grafton County |
| Civilian employed pop. (16 years and over) | 15,370 | 29,715 | 44,389 |
| Percent of Employment by Industry (percent) | | | |
| Agriculture, forestry, fishing and hunting, and mining | 5.3 | 2.5 | 1.9 |
| Construction | 9.4 | 9.2 | 8.7 |
| Manufacturing | 9.7 | 9.7 | 9.3 |
| Wholesale trade | 2.5 | 2.6 | 1.6 |
| Retail trade | 10.3 | 11.2 | 12.7 |
| Transportation and warehousing, and utilities | 2.9 | 4.1 | 2.8 |
| Information | 1.5 | 2.1 | 1.4 |
| Finance and insurance, and real estate | 4.7 | 4.8 | 4.5 |
| Professional, scientific, and mgmt., admin. and waste mgmt. services | 8.8 | 9.5 | 7.1 |
| Education services, health care, and social assistance | 30.4 | 25.3 | 33.1 |
| Arts, entertainment, and recreation, and accomd. and food services | 5.5 | 10.1 | 11.0 |
| Other services, except public administration | 3.9 | 4.9 | 3.7 |
| Public administration | 5.1 | 3.8 | 2.1 |

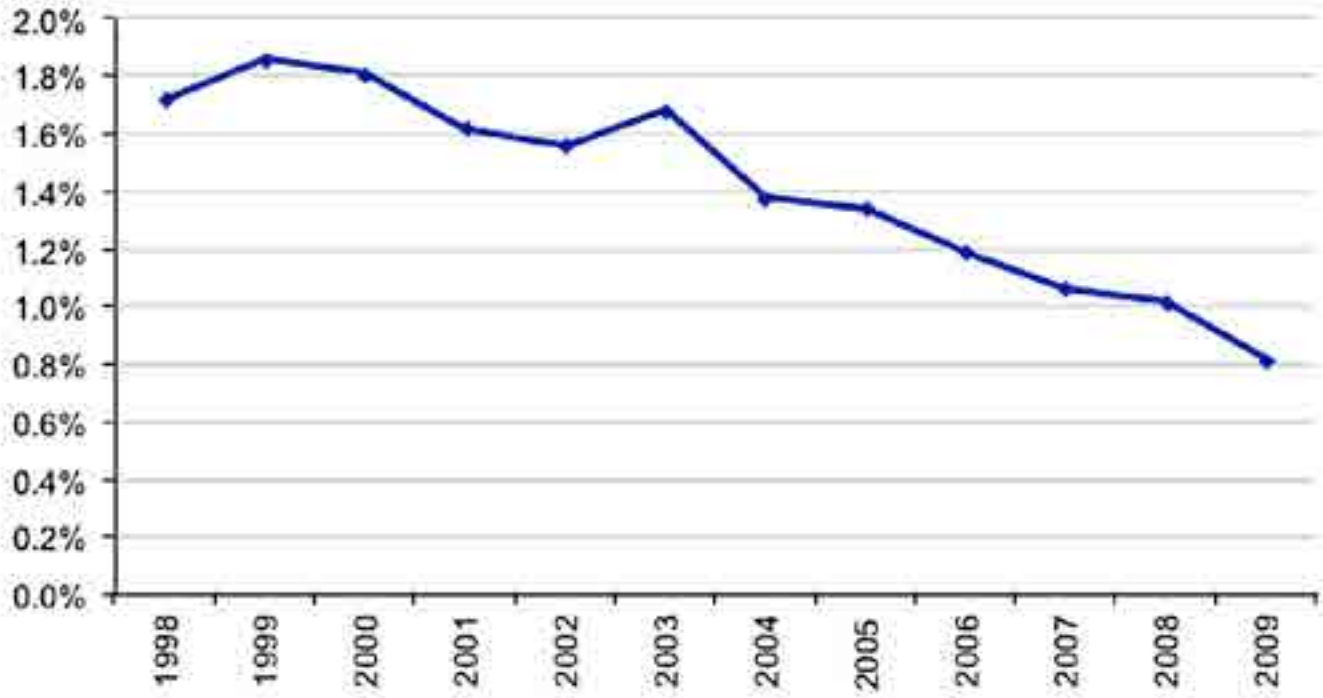
*Source: U.S. Census Bureau, ACS, 2009.*

**Commodity Industries**

*Timber*

There is a long standing history of timber harvesting and wood-product manufacturing in the northern states of Vermont and New Hampshire. However, as was the case in the Northern Sub-Region, these once dominant industries have been in sharp decline. In 1998, timber-related jobs represented 1.7 percent of total employment in the three-county WRJ Sub-Region. By 2008, this figure was down to 0.8 percent (see Figure I.6) (U.S. Dept of Commerce, 2010a). In 2010, the total number of timber-related jobs in the WRJ Sub-Region is estimated at 735, including both private employment and independent proprietors (U.S. Dept of Commerce, 2010a, b).

**Figure I.6. Percent of Total Private Employment in Timber in the WRJ Sub-Region, 1998-2009**




*Source: U.S. Dept. of Commerce, Census Bureau. 2010a*

In 2009, 1.17 million cords of wood were harvested in New Hampshire forests (NEFA, 2011). This is a significant reduction from 2005 levels, which is consistent with the economic recession. New Hampshire landowners received over $30 million from timber sales, and forest-based manufacturing's estimated (2009) contribution to the state's economy was $1.15 billion in output, 8,160 jobs, and a payroll of around $384 million a year (NEFA, 2011). Vermont recorded similar figures in 2005, which have also likely declined in the last few years. Based on 2005 figures, Vermont forest-based manufacturing is estimated at contributing nearly $1.0 billion in value of shipments to the economy, or 9.3 percent of the state's total manufacturing sales (NEFA, 2007). Windsor County was responsible for the most timber harvesting in the state in 2007, with 17 sawmills in the area relying on this activity (VT DOL, 2010a).

*Agriculture*

Table I.10 reveals the number of farming operations, farm size, acres of farmland, and the value of agricultural products produced in Vermont and New Hampshire and each of the focal counties in the sub-region. The state of Vermont has more than double the amount of farmland acreage than any of the other states in the region, with a commodity market value of over $670 million per year. While New Hampshire has far less land in agricultural production, USDA Census data reveals the number of agricultural enterprises in the state increased by over 800 during 2002-2007. In 2007, there were just less than 300 thousand acres of farmland within the three counties of the WRJ Sub-Region. In comparison to the other two counties, Grafton County experienced the largest percent increase in farmland acres from 2002-2007, at 16.5 percent.

**Table I.10. Farming in the WRJ Sub-Region**

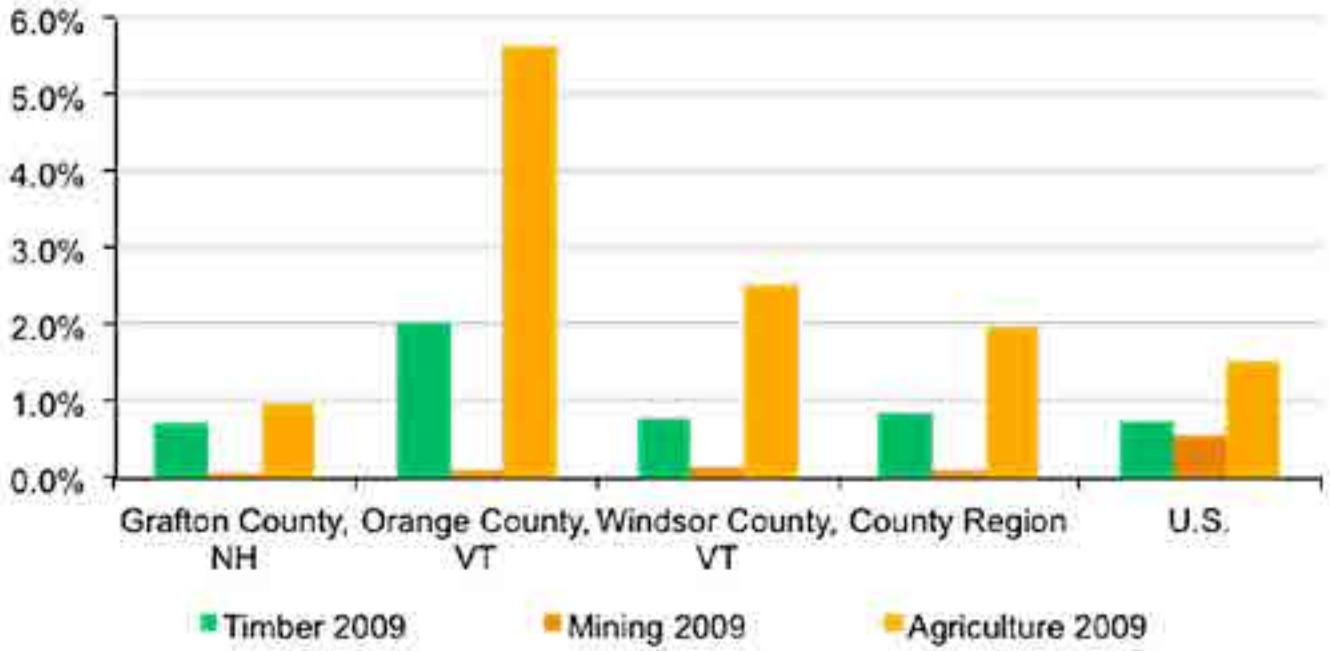
| Agriculture in the WRJ Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Vermont | 6,984 | 177 | 1,233,313 | -0.93 | 673,713,000 |
| New Hampshire | 4,166 | 113 | 471,911 | 6.08 | 199,051,000 |
| Orange County (VT) | 683 | 149 | 101,645 | -7.94 | 43,292,000 |

| Agriculture in the WRJ Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Windsor County (VT) | 767 | 125 | 95,972 | 6.69 | 24,978,000 |
| Grafton County (NH) | 552 | 181 | 99,964 | 16.52 | 34,393,000 |

*Source: USDA, Ag. Census, 2002; 2007.*

Orange County has the highest market value of agricultural products sold out of the three counties, and relies much more heavily on the agricultural industry for employment compared to the sub-region as a whole (BEA, 2011b). Figure I.7 shows the breakdown of employment by commodity industry. Unlike other regions, agricultural employment is larger than timber in each county, while mining is again a minimal contributor to employment in the region.

**Figure I.7. Commodity Sectors in WRJ Sub-Region, Percent of Total Employment**




*Source: U.S. Dept. of Commerce, BEA, 2011b.*

** Note data for timber and mining are from County Business Patterns which excludes proprietors, government, and railroad. Data for agriculture are from Bureau of Economic Analysis. The latest year for each data source may vary due to different data release schedules.*

As noted in the Northern Sub-Region profile, both Vermont and New Hampshire are working to strengthen their food system and abilities to meet local demands with locally produced products. New grant and loan programs have been put in place to try and retain productive working lands and lessen the financial barriers for beginning farmers (American Farmland Trust, 2011).

**Recreation and Tourism-Related Industries**

The travel and tourism industry continues to be a significant and growing contributor to the local and regional economies within the Watershed. Total direct spending from annual travel and tourism in the northern states of Vermont and New Hampshire is estimated at nearly $6 billion (Economic & Resources Policy, Inc., 2010; Goss, 2011). This spending supports nearly 17 percent of the total private workforce in the WRJ Sub-Region (BEA, 2011b). As with other parts of the Northeast, towns within the Watershed are expanding opportunities

associated with recreation and tourism. Many of the quaint towns in the sub-region host annual festivals and cultural events aimed at attracting crowds from beyond the community borders. A majority of these events are centered on the historic cultural and economic makeup of the region, and supported by the beauty of the natural landscape. The WRJ Sub-Region is home to designated national historic districts and a national scenic byway. The town of Woodstock is centered by a storybook New England village with beautiful late Colonial and Victorian architecture, covered bridges, and a main street with quaint shops and bed and breakfast establishments. Woodstock and many of the towns in the region rely heavily on those visiting and passing through on to other northern attractions. With the strong presence of agriculture and tourism in the region, especially in Orange County, agritourism seems to be expanding at a considerable rate.

Recreation opportunities abound within the counties of the WRJ Sub-Region as they do in much of the Watershed. To the west is the Mt. Carmel State Forest and eastern range of the Green Mountains. The Connecticut River in the region is enjoyed both leisurely and those seeking an adventure. Additional lands acquired by the Refuge would provide further opportunities to locals and non-local visitors. Traditional activities on lands under Refuge management include fishing, hunting, wildlife observation, photography, and environmental education. Snowmobiling is a very popular activity in this region and would be permitted on lands under Refuge management. The economic contribution of the snowmobile industry in Vermont alone has grown to an estimated $550 million (Watson, 2003). Details about the economic contribution associated with wildlife viewing, hunting, and fishing in Vermont and New Hampshire are provided in Table I.5 in the previous sub-region profile.

As touched on in the Northern Sub-Region profile, some of the most popular activities in Vermont and New Hampshire do not fall into the category of traditional recreation. Nearly half of all Vermont and New Hampshire residents participate in hiking and a third participate in kayaking and canoeing (Outdoor Industry Foundation, 2003). Water-based recreation (boating, fishing, and swimming) on all New Hampshire rivers, streams, lakes and ponds is said to have contributed $1.2 billion in 2003, and $109 million in Vermont in 2004 (Shapiro and Kroll, 2003). New Hampshire and Vermont recently developed a partnership and released the Connecticut River Recreation Management Plan in 2009 that discusses, among other things, how to encourage businesses to capture the outdoor recreation market while protecting the fragile ecological systems of the river and surrounding areas.

**Land Use and Ownership**

Similar to the Northern Sub-Region, a vast majority (91 percent) of the landscape in the WRJ Sub-Region is classified as forest (NASA MODIS, 2006). Rural Grafton County with its designated White Mountain National Forest ranked the highest at 95 percent forested. In 2000, residential land was estimated at 34.3 percent in Orange County, 47.2 percent in Windsor County, and 40.1 percent in Grafton County. These residential percentages are almost entirely classified as 'exurban,' where average lot sizes can range from 1.7 to 40 acres (Headwaters Economics EPS-HDT, 2011; Theobald, 2005). When compared to 1980 levels, residential acres (in 2000) represented increases of 55 percent, 19.8 percent, and 23.6 percent, respectively.

Grafton County's total land area of 1.1 million acres is more than the combined acreage of Windsor and Orange County. Grafton County's 356,061 acres of Federal land also dwarfs Windsor and Orange County's 29,168 and zero acres, respectively. A vast majority of these federal acres are under the management of the U.S. Forest Service. Table I.11 gives the general breakdown of total land ownership by county.

**Table I.11. Land Ownership (acres) in WRJ Sub-Region**

| | Orange County, VT | Windsor County, VT | Grafton County, NH | County Region |
|---|---|---|---|---|
| **Total Area** | 442,432 | 624,855 | 1,119,017 | 2,186,305 |
| **Private Lands** | 427,622 | 545,381 | 733,230 | 1,706,233 |
| **Federal Lands** | 0 | 29,168 | 356,061 | 385,229 |
| **State Lands** | 9,635 | 44,808 | 26,876 | 81,319 |
| **City, County, Other** | 3,838 | 5,490 | 2,850 | 12,178 |

*Source: Conservation Biology Institute, 2006, 2008. (As cited by Headwaters Economics EPS-HDT Report)*

To date, the Refuge has acquired and conserved just over 35,000 acres throughout the Watershed, almost exclusively through fee-acquisitions. The Refuge currently does not own any acreage in the WRJ Sub-Region; however large tracts in Orange and Grafton County have been identified for their high ecological value and

acquisition potential. For a comprehensive discussion on the potential impacts of Federal fee acquisitions and conservation easements, please reference Section II.

### Tri-State Border Sub-Region

The Tri-State Border (TSB) Sub-Region of the Watershed consists of Windham County, Vermont, Cheshire County, New Hampshire, and Franklin County, Massachusetts. Currently, there is a 285-acre parcel in Windham County, and three relatively small land units equating to 55 acres in Franklin County, that are under Refuge ownership and management. Additional lands near the junction of the three state borders have been identified for potential acquisition and others solely for their ecological significance. The Refuge's flagship cooperative center—Great Falls Discover Center—in partnership with the Massachusetts Department of Conservation and Recreation and a number of other partners, is located in nearby Turners Falls, Massachusetts.

Four additional communities of management interest are highlighted in the TSB Sub-Region profile. These being: Brattleboro, Vermont; Keene, New Hampshire; Winchester, New Hampshire; and Greenfield, Massachusetts. Brattleboro is Windham County's largest township, and like many other noted communities in Vermont, it is rich in the arts, rooted in agriculture, and teeming with summer and winter recreation opportunities. The town of Keene, accounts for nearly 30 percent of Cheshire County's entire population and serves as the geographic and socio-economic center of the county (UNH Extension, 2010). Historically, Keene was known for its textile mills which held contracts with the U.S. Government throughout the Civil War, World War I, and World War II (Miller, 2003). Today, Keene is home to two colleges and is a center for insurance, education and tourism, while still retaining the Victorian architecture from its mill town era. Winchester, NH is a smaller town located just 13 miles south of the larger town of Keene. It, too, has historic ties to the textile industry and now retains a rural way of life with adjacent parks and preserves. Greenfield is also its respective county's largest city and is noted for a vibrant downtown that continues to see considerable infrastructure investment. Such investments are expected to add to population growth in the near term.

#### Population

Table I.12 gives the population estimates and trends for Vermont, New Hampshire, and Massachusetts, the three TSB Sub-Region counties, and the four towns of interest. Each of the three states experienced growth in their total population from 2000 to 2010, with New Hampshire documenting the highest increase at 6.5 percent. Cheshire County, New Hampshire and Franklin County, Massachusetts have similar populations with just over 70,000 residents. However, Franklin County is the least populated county in the state of Massachusetts. Windham County is home to 30,000 fewer residents, yet is one of the more populous Vermont counties in the Watershed. Population densities for the counties reflect their contrast in population size as they have fairly similar land areas. Total population for the three-county sub-region has been increasing relative to 1990 levels, yet has experienced some decline in the past few years (see Figure I.8). Based on population forecasts from respective state departments, moderate population increases are expected for Cheshire and Franklin County over the next decade, with slight declines expected in Windham County.

**Table I.12. Population Figures for TSB Sub-Region**

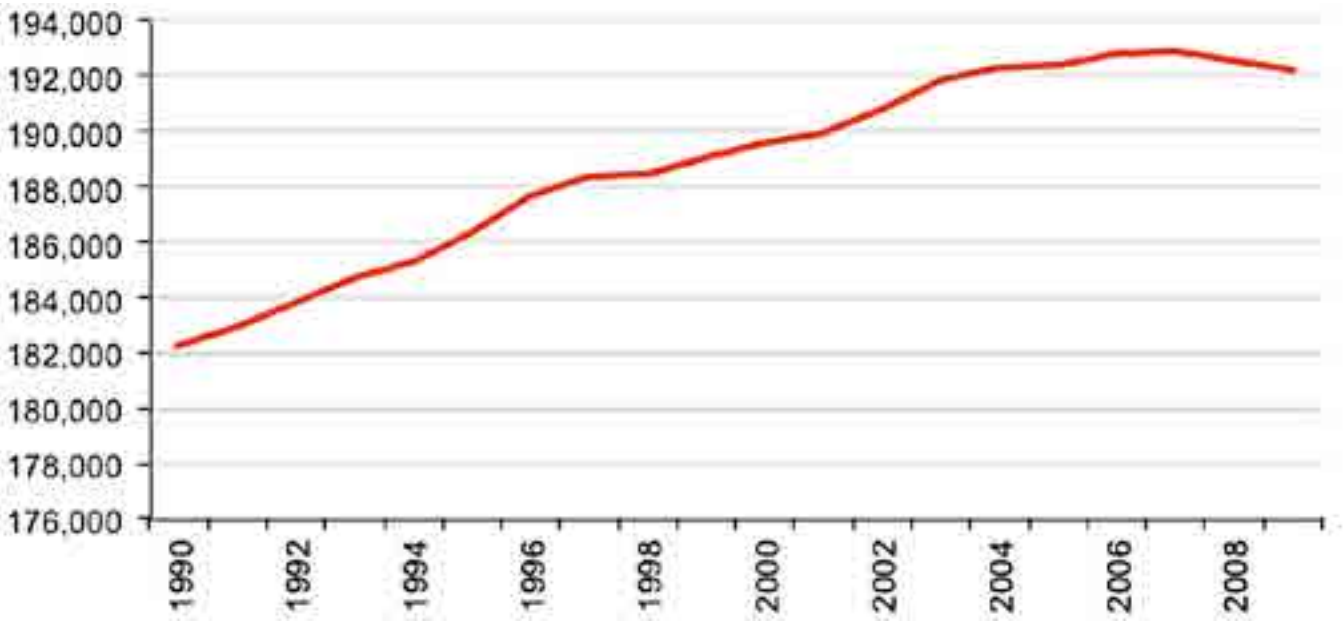
| Tri-State Border Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Vermont | 625,741 | 40.6 | 67.65 | 9,250 | 2.8 | 638,809 |
| New Hampshire | 1,316,470 | 39.6 | 146.80 | 8,968 | 6.5 | 1,470,000 |
| Massachusetts | 6,547,629 | 38.5 | 738 | 4,845 | 3.1 | 6,767,712 |
| *Tri-State Border Region* | | | | | | |
| Windham County (VT) | 44,513 | 43.6 | 56 | 798 | 0.7 | 42,585 |
| Cheshire County (NH) | 77,117 | 40 | 104 | 739 | 4.5 | 84,672 |
| Franklin County (MA) | 71,372 | 42.8 | 102 | 702 | -0.2 | 78,452 |

| Tri-State Border Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| *Towns of Interest* | | | | | | |
| Brattleboro, VT | 11,633 | 44.9 | 359 | 32.4 | -3.1 | N/A |
| Greenfield, MA | 17,862 | 41.5 | 816 | 21.9 | -1.7 | N/A |
| Keene, NH | 22,539 | 32.6 | 599 | 37.6 | -0.1 | N/A |
| Winchester, NH | 4,283 | 40.8 | 77 | 55.5 | 3.2 | N/A |

*Source: U.S. Census Bureau, 2010; New Hampshire Office of Energy and Planning, 2006; Vermont DOL, 2010a; MISER, 2003. *Note source for Resident population and median age estimates for Towns of Interest: U.S. Census Bureau's 2005-2009 American Community Survey 5-yr. Estimates.*

The towns of Brattleboro, Keene, and Greenfield have experienced slight declines in their population over the last decade, while remaining the most populous cities in their respective counties. Winchester was the only town of the four to experience a growth in population over the last ten years. With only 77 people per square mile, Winchester is much more rural when compared to the other population densities in the several hundred. The town of Keene maintains a median age of 32 years, which is eight years younger than any other town in the sub-region profile. This statistic is likely representative of the large student population in the county.

**Figure I.8. Regional Population Trends in TSB Sub-Region, 1990-2008**




*Source: U.S. Department of Commerce, BEA, 2011a.*

In 2010, the U.S. population consisted of 63.7 percent of white persons not of Hispanic or Latino origin (U.S. Census Bureau, 2010). Comparatively, Vermont's resident population consisted of 94.3 percent, which currently ranks it as having the second highest proportion of white persons in the nation. New Hampshire shares a similar racial makeup with that of Vermont, with 92.3 percent of the population designated as white people not of Hispanic or Latino origin. While, the state of Massachusetts documents a lower percentage of white residents (76.1percent), all three counties included in the TSB Sub-Region profile note percentages above 92 percent. Over 96 percent of the residents in each of the three counties were born in the U.S. Education attainment figures in all three counties are also above the national average. In Windham, Cheshire, and Franklin County, 90 percent of the residents over the age of twenty-four are high school graduates and 30 percent have earned a bachelor's or advanced degree (U.S. Census Bureau, ACS, 2009).

**Regional Employment and Income**

The TSB Sub-Region continues to sustain a fairly rural way of life, especially when compared to regions further south in the Watershed. Like many of the communities along the Connecticut River, towns in this area were historically known for their manufacturing capabilities. While this sector of the economy is nowhere near its historic levels, it is still a major economic engine for the area. Table I.13 gives median household income, unemployment rates, and the percentage of the population living below the poverty line in the TSB Sub-Region.

**Table I.13. Income, Unemployment, and Poverty Rates**

| | Median Household Income (2009 $s) | Percent Unemployed | | | Percent below Poverty (2009) |
|---|---|---|---|---|---|
| | | 2000 | 2009* | 2010* | |
| US | 50,221 | 4.0 | 9.9 | 9.4 | 14.3 |
| Vermont | 51,284 | 2.7 | 6.6 | 5.6 | 11.5 |
| New Hampshire | 63,033 | 2.7 | 6.4 | 5.3 | 8.6 |
| Massachusetts | 64,496 | 2.7 | 8.5 | 8.0 | 10.3 |
| *TSB Sub-Region* | | | | | |
| Windham County (VT) | 46,465 | 2.4 | 6.1 | 5.3 | 12.3 |
| Cheshire County (NH) | 55,719 | 2.7 | 6.0 | 5.1 | 9.6 |
| Franklin County (MA) | 52,185 | 2.5 | 8.6 | 7.6 | 10.3 |
| *Towns of Interest* | | | | | |
| Brattleboro, VT | 38,301 | 2.7 | 6.2 | 5.2 | N/A |
| Greenfield, MA | 45,188 | 2.7 | 8.5 | 7.6 | N/A |
| Keene, NH | 51,375 | 2.6 | 5.4 | 4.7 | N/A |
| Winchester, NH | 40,821 | 4.6 | N/A | 6.5** | N/A |

*Source: U.S. Bureau of Labor Statistics, 2011; U.S Census, ACS, 2009; U.S. Census Quickfacts, 2009; New Hamphsire ELMIB, 2010; Vermont DOL, 2010b; Massachusetts EOLWD, 2010; U.S. Census Bureau, 2000. (*) Denotes unemployment rates as of December of that year. (**) Denotes estimates made using the Wolfram Alpha Computational Knowledge Engine, 2011.*

As of 2009, the three counties in the TSB Sub-Region all reported median incomes below their respective state-wide medians. Furthermore, each of the towns included in this profile reported median incomes below their respective county-wide medians. The (2009) median household income in Brattleboro, Vermont, $38,301, is the lowest out of any town examined in the Watershed profile. Unemployment rates are presented for the years 2000, 2009, and 2010 given the economic volatility in recent years. At the start of the decade in year 2000, all three counties reported unemployment below 3 percent. By the end 2009, unemployment in the sub-region was above 6 percent, with Franklin documented the highest rate at 8.6 percent. Unemployment rates in the towns of interest remained below the national average throughout the recession and were declining in all areas by the end of 2010. Keene, New Hampshire endured the best in terms of unemployment throughout the volatility of the last decade.

Table I.14 gives the employment breakdown by industry for the three counties of interest. The largest employer in all three counties is the educational services, health care, and social assistance industry, accounting for between 24.8 percent and 31.3 percent of the workforce. Manufacturing was the second largest employer in Cheshire and Franklin Counties, while retail was the second largest in Windham County.

**Table I.14. Employment by Industry in the TSB Sub-Region**

| Full-Time and Part-Time Employment by Sector | TSB Sub-Region Windham County | Cheshire County | Franklin County |
|---|---|---|---|
| Civilian employed pop. (16 years and over) | 23,401 | 40,874 | 37,729 |
| Percent of Employment by Industry (percent) | | | |
| Agriculture, forestry, fishing and hunting, and mining | 2.0 | 1.0 | 2.1 |
| Construction | 8.8 | 7.3 | 6.6 |
| Manufacturing | 8.9 | 15.2 | 13.4 |
| Wholesale trade | 4.0 | 4.5 | 2.2 |
| Retail trade | 11.7 | 14.6 | 10.8 |
| Transportation and warehousing, and utilities | 4.7 | 3.6 | 4.9 |
| Information | 1.7 | 2.1 | 2.9 |
| Finance and insurance, and real estate | 5.5 | 5.1 | 3.9 |
| Professional, scientific, and mgmt., admin. and waste mgmt. services | 7.3 | 7.3 | 6.5 |
| Education services, health care, and social assistance | 26.7 | 24.8 | 31.3 |
| Arts, entertainment, and recreation, and accomd. and food services | 11.0 | 7.8 | 6.9 |
| Other services, except public administration | 4.8 | 3.9 | 4.4 |
| Public administration | 2.8 | 2.7 | 4.1 |

*Source: U.S. Census Bureau, ACS, 2009.*

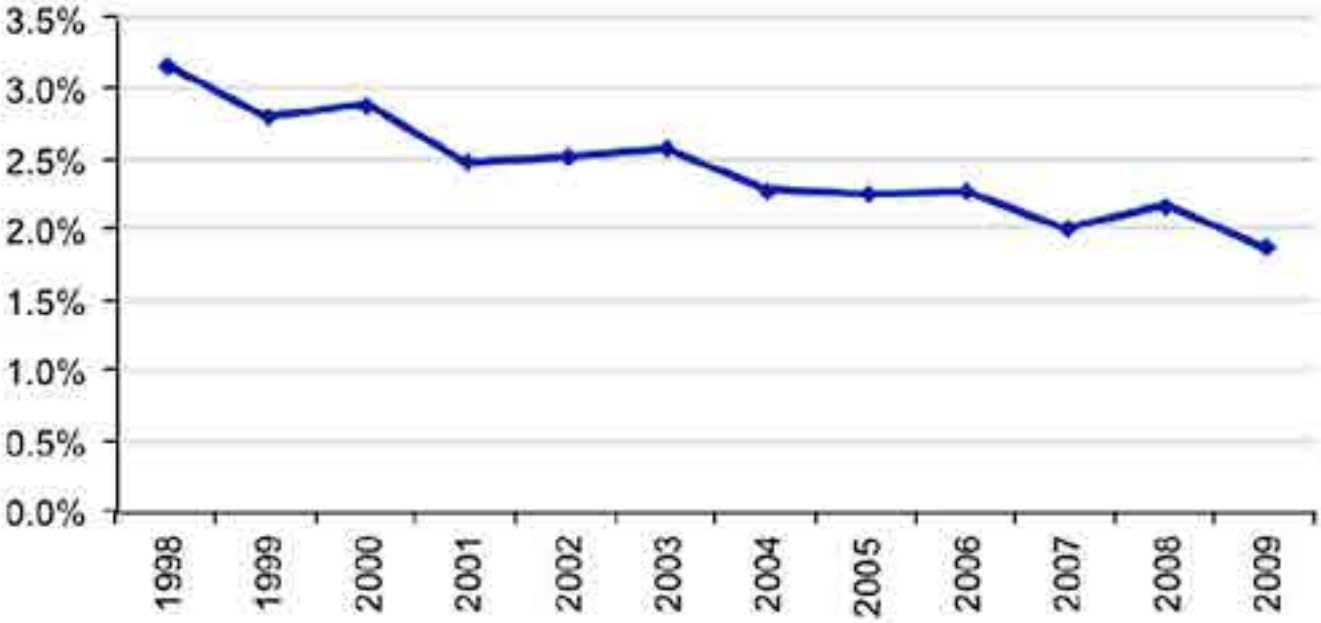
Brattleboro, Keene, and Greenfield remain the prominent city centers within their respective counties. These towns have historic ties to industries such as textiles and agriculture. While production practices may have ceased, these towns now lean on the cultural history and natural attractions of the area to attract visitors. Greenfield especially has been the site of considerable infrastructure investment. Proposed projects include a solar farm installation on the city's capped landfill (which would be the largest in all of New England), as well as a regional transit center and proposed Amtrak service along the Burlington-New York-Washington corridor (Town of Greenfield, Accessed 2011). If approved, these projects could contribute significant economic activity and attract new residents in the future.

**Commodity Industries**

*Timber*

There is a long standing history of timber harvesting in the Watershed, especially in the northern states of Vermont and New Hampshire. The expansive timber production in the area gave way to timber-related industries, such as saw mills, pulp/paper mills, and wood-product manufacturers. However, these once dominant industries have been in sharp decline. In 1998, timber-related jobs represented 3.2 percent of total employment in the three-county region. By 2009, this figure was down to 1.9 percent (see Figure I.9). The total number of timber-related jobs in the Tri-State Border Sub-Region is estimated at 1,345, including both private employment and independent proprietors (U.S. Dept. of Commerce, 2010a, b).

**Figure I.9. Percent of Total Private Employment in Timber in the TSB Sub-Region, 1998-2009**




*Source: U.S. Dept. of Commerce, 2010a*

As previously noted in the sub-region profiles prior, 1.17 million cords of wood were harvested in New Hampshire forests in 2009 (NEFA, 2011). This is a significant reduction from 2005 levels, which is consistent with the recent economic recession. New Hampshire landowners received over $30 million from timber sales, and forest-based manufacturing's estimated (2009) contribution to the state's economy was $1.15 billion in total output, 8,160 jobs, and a payroll of around $384 million per year to the state's economy (NEFA, 2011). Vermont recorded similar figures in 2005, which have also likely declined in the last few years. In 2005, Vermont forest-based manufacturing is estimated to have contributed nearly $1.0 billion in value of shipments to the economy, or 9.3 percent of the state's total manufacturing sales (NEFA, 2007). In 2008, Windham County was the top-ranking timber harvesting county in Vermont, with 15 supporting sawmills (Vermont DOL, 2010a). Massachusetts has experienced similar reductions in production and processing. In 1993 there were 94 confirmed active sawmills; by 2005 there were only 49, which were producing roughly 49 million board feet (Damery et al., 2006). Individually, Franklin County, Massachusetts has six registered sawmills and two portable bandmills (Damery et al., 2006).

*Agriculture*

Table I.15 reveals the number of farming operations, average farm size, acres of farmland, and the value of agricultural products produced in the three states and three focal counties that makeup the TSB Sub-Region. The state of Vermont has more than double the amount of farmland acreage than any of the other states in the Watershed, with an annual commodity market value of $673 million. This is nearly $200 million more than Massachusetts' agricultural value, and over three times that of New Hampshire. USDA Census data reveal the number of agricultural enterprises in New Hampshire increased by over 800 from 2002 to 2007. Additionally, the three New Hampshire counties examined in the Watershed (Coos, Grafton, and Cheshire) all experienced increases in farmland acres of 15 percent or higher from 2000 to 2007. Windham County, Vermont was the only county in the sub-region to experience a decline in farmland acres during this time period. As of 2007, the three-county TSB Sub-Region encompassed 178,000 acres of active farmland.

**Table I.15. Farming in the TSB Sub-Region**

| Agriculture in the TSB Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Vermont | 6,984 | 177 | 1,233,313 | -0.9 | 673,713,000 |
| New Hampshire | 4,166 | 113 | 471,911 | 6.1 | 199,051,000 |
| Massachusetts | 7,691 | 67 | 517,879 | -0.1 | 489,820,000 |

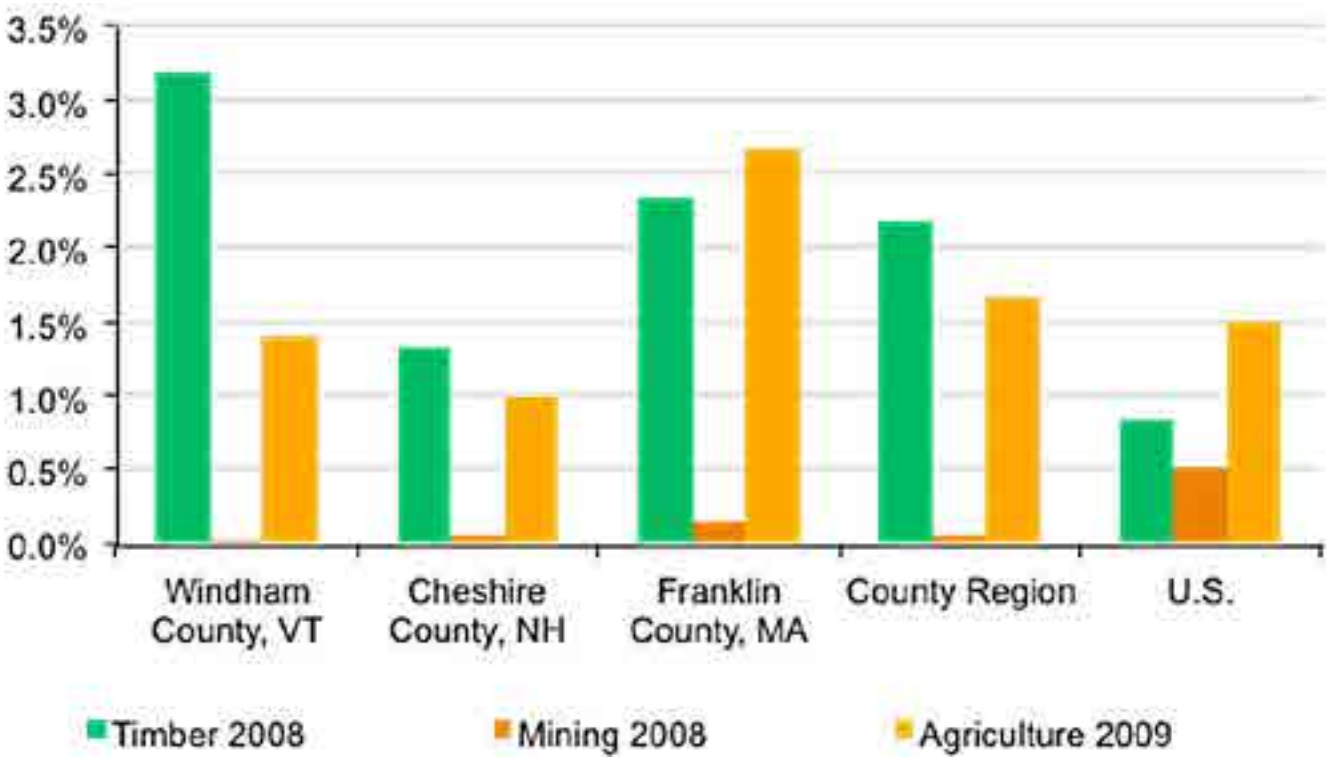
| Agriculture in the TSB Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Windham County (VT) | 428 | 119 | 50,764 | -17.6 | 21,408,000 |
| Cheshire County (NH) | 419 | 115 | 48,241 | 16.9 | 15,406,000 |
| Franklin County (MA) | 741 | 107 | 79,465 | 7.0 | 56,844,000 |

*Source: USDA, Ag Census, 2002, 2007.*

As noted in the previous sub-region profiles, Vermont and New Hampshire are investing resources to strengthen their food systems and abilities to meet local demands with locally produced products. The state of Massachusetts seems to share these ambitions with Governor Patrick recently announcing the establishment of the Massachusetts Food Policy Council, who is set with advancing the goals of bringing healthy, local foods to all residents in the Commonwealth (Mass.gov, 2011). Farmers in Massachusetts are recognizing and establishing local outlets for their products. For instance, the state has seen almost a 250% increase in the number of farmers markets between 2007 and 2010 alone (Agricultural Day Priority Issues, 2011).

Figure I.10 displays the breakdown of employment by commodity industry in the TSB Sub-Region. Windham County, Vermont has the highest percentage of timber employment across the three counties, while Franklin County, Massachusetts has the highest percentage of agricultural employment. The TSB Sub-Region as a whole maintains a higher percentage of total employment in the timber and agricultural industries than the national average.

**Figure I.10. Commodity Industries in the TSB Sub-Region, Percent of Total Employment**




*Source: U.S. Dept of Commerce, BEA. 2011b.*

** Note data for timber and mining are from County Business Patterns which excludes proprietors, government, and railroad. Data for agriculture are from Bureau of Economic analysis. The latest year for each data source may vary due to different data release schedules.*

**Recreation and Tourism-Related Industries**
The travel and tourism industry continues to be a significant and growing contributor to the local and regional economies within the Watershed. Total direct spending from annual travel and tourism in the northern states of Vermont and New Hampshire is estimated at nearly $6 billion (Economic & Resources Policy, Inc., 2010; Goss, 2011). In 2009, total direct spending from annual travel and tourism in Massachusetts was estimated at $14.4 billion (Massachusetts Department of Travel and Tourism, 2010). This area of spending is said to support nearly 12 percent of the total workforce in Vermont, and is tied to over 120 thousand jobs in the state of Massachusetts. Many of the towns within the TSB Sub-Region are attempting to capture more of this valuable market by hosting annual festivals and cultural events. For instance, the town of Keene is notorious for hosting the annual Pumpkin Festival which is estimated to have between 50-80,000 attendees (Keene Pumpkin Festival, 2011). The smaller town of Winchester, New Hampshire has continued to host the annual Pickle Festival that has the ambiance of an old-fashioned town fair. There are many other events in the region that lean on the area's historic and cultural roots. Area farmers and artisans are once again finding local markets for their goods, while catering to buyers and their overall experience. Agritourism seems to be expanding at a considerable rate, with each state in the Watershed now having a website and interactive map just for these enterprises. In Massachusetts alone, there are over 400 enterprises registered in the state's agritourism brochure with a significant concentration of them located within the Watershed (MA Dept. of Ag. Resources, 2011).

There are abundant recreation opportunities within the TSB Sub-Region. Traditional activities on lands under Refuge ownership and management include fishing, hunting, wildlife observation, photography, and environmental education. Snowmobiling is a popular winter recreation activity that is often allowed on lands under Refuge ownership. The economic contribution of the snowmobile industry in Vermont alone has grown to an estimated $550 million (Watson, 2003). Details about the economic contribution associated with wildlife viewing, hunting, and fishing in Vermont, New Hampshire and Massachusetts are provided in Table I.16.

**Table I.16. Recreation Estimates and Expenditures for Vermont, New Hampshire, and Massachusetts**

| Recreation Estimates | Residents and Non-Residents | Vermont | New Hampshire | Massachusetts |
|---|---|---|---|---|
| **Fishing** | # of Anglers | 114,000 | 230,000 | 497,000 |
| | Total Expenditures | 63,749,000 | 172,413,000 | 769,631,000 |
| | Trip-Related | 40,535,000 | 88,581,000 | 297,312,000 |
| | Equipment and Other ($) | 23,214,000 | 83,832,000 | 472,319,000 |
| **Hunting** | # of Hunters | 73,000 | 61,000 | 73,000 |
| | Total Expenditures | 189,707,000 | 74,467,000 | 70,824,000 |
| | Trip-Related | 20,928,000 | 17,665,000 | 36,675,000 |
| | Equipment and Other ($) | 168,779,000 | 56,802,000 | 34,149,000 |
| **Wildlife Watching** | Total Participants | 468,000 | 710,000 | 1,919,000 |
| | Total Expenditures | 122,841,000 | 273,769,000 | 754,965,000 |
| | Trip-Related | 58,219,000 | 116,136,000 | 148,779,000 |
| | Equipment and Other ($) | 64,622,000 | 157,633,000 | 606,186,000 |

*Source: USFWS National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 2006.*

As mentioned previously, some of the most popular activities in Vermont and New Hampshire do not fall into the category of traditional recreation. Nearly half of all Vermont and New Hampshire residents participate in hiking and a third participate in kayaking and canoeing (Outdoor Industry Foundation, 2003). Water-based recreation (boating, fishing, and swimming) on all New Hampshire rivers, streams, lakes and ponds is said to have contributed $1.2 billion in 2003, and $109 million in Vermont in 2004 (Shapiro and Kroll, 2003). New Hampshire and Vermont recently developed a partnership and released the Connecticut River Recreation Management Plan

in 2009 that discusses, among other things, how to encourage businesses to capture the outdoor recreation market while protecting the fragile ecological systems of the river and surrounding areas.

**Land Use and Ownership**
Similar to the Northern and WRJ Sub-Regions, a vast majority (95 percent) of the landscape in the TSB Sub-Region is classified as forest (NASA MODIS, 2006). Land classified as residential (in 2000) was estimated at 50 percent in Windham County, 47 percent in Cheshire County, and 49 percent in Franklin County (Theobald, 2005). These residential percentages are almost entirely classified as 'exurban,' where average lot sizes can range from 1.7 to 40 acres, and allude to the region's relatively rural landscape (Headwaters Economics EPS-HDT, 2011). When compared to 1980 levels, the classified residential acres in year 2000 represented increases of 107 percent, 50 percent, and 21 percent in the three counties, respectively.

The three counties included in the TSB Sub-Region are fairly similar in terms of total land area. A vast majority of their lands are also in private ownership (88 percent or over). Nearly all of the 37,121 federally owned acres in the sub-region are located within Windham County, however, both Franklin and Cheshire County have a fair amount of public land owned by the state. Table I.17 gives the breakdown of land ownership across the three counties.

**Table I.17. Land Ownership (acres) in the TSB Sub-Region**

| | Windham County, Vermont | Cheshire County, New Hampshire | Franklin County, Massachusetts | County Region |
|---|---|---|---|---|
| **Total Area** | 510,425 | 466,313 | 463,589 | 1,440,327 |
| **Private Lands** | 460,867 | 439,062 | 407,989 | 1,307,918 |
| **Federal Lands** | 37,087 | 0 | 34 | 37,121 |
| **State Lands** | 5,793 | 20,860 | 52,684 | 79,337 |
| **City, County, Other** | 6,535 | 6,392 | 2,882 | 15,808 |

*Source: Conservation Biology Institute, 2006, 2008 (As cited by Headwaters Economics EPS-HDT Report, 2011).*

To date, the Refuge has acquired and conserved just over 35,000 acres throughout the Watershed, almost exclusively through fee-acquisitions. Within the TSB Sub-Region, the Refuge owns three smaller parcels in Franklin County amounting to 55 acres, and an additional 283 acre tract in Windham County. Additional lands in the TSB Sub-Region have been identified for the high ecological value and acquisition potential. The identified acres are located predominantly in the riparian areas along the Connecticut River and in the adjacent floodplains. For a comprehensive discussion on the potential impacts of federal fee acquisitions and conservation easements, please reference Section II.

### Greater Amherst Sub-Region
The Greater Amherst Sub-Region of the Watershed consists exclusively of Hampshire County, Massachusetts. Hampshire County, located in west-central Massachusetts, includes the Fort River Division of the Refuge. The Division currently occupies 197 acres within an approved Refuge boundary of 2,200 acres. The acquired division lands abut the Fort River, which is an influential tributary to the larger Connecticut River. The county also includes the Mill River Division of the Refuge which currently occupies 257 acres adjacent to the Connecticut River, and has an approved Refuge boundary of 2,000 acres. Hampshire County has rich soils and makes up the middle portion of what has been referred to as "Pioneer Valley." The fertile soil and adjacent water source of the Connecticut River laid the ground work for early agricultural production. The river also provided a source of power that allowed area towns to boom with manufacturing jobs in the 19$^{th}$ and 20$^{th}$ centuries. Today, Hampshire County is notable for the presence within its borders of the "Five Colleges", comprising the University of Massachusetts flagship campus and four well-known private colleges (Hampshire County, 2011).

Four Massachusetts' communities are also highlighted in the Greater Amherst Sub-Region profile. These include: Hadley, Northampton, Lee, and Westfield. Lee, Massachusetts, just over the Hampshire County boundary in Berkshire County, is one of the area towns deeply rooted in manufacturing. The town was once home to 25 operating paper mills, yet today only one papermaking facility remains still in operation (CPBIS, 2011; Town of Lee, 2011). However, the historic sites and architecture from the early time period, along with the natural beauty of the surrounding watershed have made this area a year-round tourist destination for more than 50 years. The towns of Hadley, Northampton, and Westfield all seem to cater to the large collegiate student population in the area. The region has become known as the "happy valley" due to the eclectic art and music communities, progressive ideas, prestigious colleges and large student population.

**Population**

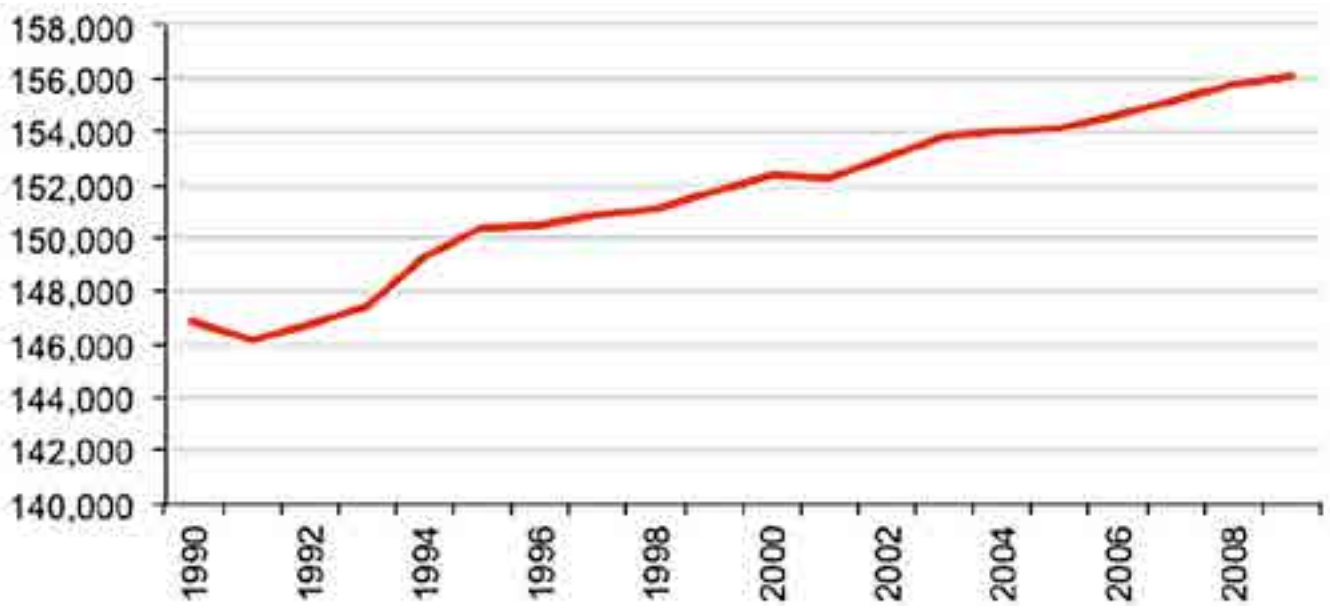
Table I.18 gives the population estimates and trends for the state of Massachusetts, Hampshire County, and the four towns of interest in the Greater Amherst Sub-Region. Both the state of Massachusetts and Hampshire County have experienced moderate growth in population between 3-4 percent over the last ten years. These population growth trends are expected to continue over the next decade. The 2010 population of 158,080 makes Hampshire County one of the least populated counties in Massachusetts. The population density in Hampshire County, 299 persons per square mile, is less than a third as dense as the entire state. The median age of the county, 36.8, is the youngest out of all of the eleven counties examined in the Watershed. This may account for the considerable student population in the county. The only town included in the Greater Amherst Sub-Region profile to post positive growth in the last ten years is the largest city included, Westfield, Massachusetts, just over the border in Hampden County. The three other communities in the profile document moderate declines of less than 4 percent.

**Table I.18. Population Figures for the Greater Amherst Sub-Region**

| Greater Amherst Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Massachusetts | 6,547,629 | 38.5 | 835 | 7,840 | 3.1 | 6,767,712 |
| ***Greater Amherst Sub-Region*** | | | | | | |
| Hampshire County (MA) | 158,080 | 36.8 | 299 | 529 | 3.8 | 173,181 |
| ***Towns of Interest*** | | | | | | |
| Hadley, MA | 4,740 | 49.0 | 192 | 24.7 | -1.1 | N/A |
| Northampton, MA | 28,548 | 38.9 | 214 | 27 | -1.5 | N/A |
| Lee, MA | 5,774 | 43.7 | 802 | 35.6 | -3.5 | N/A |
| Westfield, MA | 41,373 | 37.4 | 875 | 47.3 | 3.1 | N/A |

*Source: U.S. Census Bureau, 2010; MISER, 2003. *Note: Resident population and median age estimates for Towns of Interest were pulled from U.S. Census Bureau's 2005-2009 American Community Survey 5-yr. Estimates.*

**Figure I.11. Regional Population Trends in the Greater Amherst Sub-Region, 1990-2008**




*Source: U.S. Department of Commerce, BEA, 2011a.*

In 2010, the U.S. population consisted of 63.7 percent of white persons not of Hispanic or Latino origin (U.S. Census Bureau, 2010). Comparatively, Massachusetts's population consisted of 76.1 percent white people (U.S. Census Bureau, 2010). Hampshire County reported figures well above the state demographic, with 86.2 percent of residents consisting of white people not of Hispanic or Latino origin. While this proportion is still well above the national average, it ranks Hampshire County second in the entire Watershed profile only to Hartford County, Connecticut. The majority of residents in Hampshire County, 90.7 percent, were born in the United States. Additionally, 91.7 percent of Hampshire County residents 25 years of age and older are high school graduates and 40.5 percent have earned a bachelor's or advanced degree (U.S. Census Bureau, ACS, 2009). These percentages of education attainment are the highest among the eleven counties included in the Watershed profile.

**Regional Employment and Income**

The Greater Amherst Sub-Region, like much of the Watershed, was characterized by its farms, working forests, and manufacturing towns. At the center of the Pioneer Valley, the area has long been famous for its fertile soils and beautiful scenery. Subsequently, it has been a very popular year-round tourist destination for quite some time. The region maintains much of its rural character still today, while also being known now for its relatively liberal cities that are home to large student populations. Table I.19 gives estimates for median household income, unemployment, and the percentage of the population living in poverty.

**Table I.19. Income, Unemployment, and Poverty Rates**

| | Median Household Income (2009 $s) | Percent Unemployed | | | Percent below Poverty (2009) |
|---|---|---|---|---|---|
| | | 2000 | 2009* | 2010* | |
| US | 50,221 | 4.0 | 9.9 | 9.4 | 14.3 |
| Massachusetts | 64,496 | 2.7 | 6.6 | 5.6 | 10.3 |
| ***Greater Amherst Sub-Region*** | | | | | |
| Hampshire County (MA) | 57,293 | 2.2 | 7.1 | 6.6 | 11.3 |
| ***Towns of Interest*** | | | | | |
| Hadley, MA | 62,731 | 2.1 | 7.0 | 7.2 | N/A |

| | Median Household Income (2009 $s) | Percent Unemployed 2000 | 2009* | 2010* | Percent below Poverty (2009) |
|---|---|---|---|---|---|
| Northampton, MA | 51,018 | 2.1 | 5.9 | 5.7 | N/A |
| Lee, MA | 48,860 | 2.5 | 7.0 | 6.5 | N/A |
| Westfield, MA | 52,425 | 2.7 | 8.2 | 7.9 | N/A |

*Source: U.S. Bureau of Labor Statistics, 2011; U.S. Census Bureau Quickfacts, 2009; U.S. Census Bureau, ACS, 2009-adjusted estimates; Massachusetts EOLWD, 2010. (*) Denotes unemployment rates as of December of that year.*

In 2009, Massachusetts recorded a state-wide household median income of $64,496; roughly $14,000 higher than the national median. The median household income in Hampshire County is over $7,000 less than the state average. Out of the four communities examined in the sub-region, the town of Hadley documents the highest median household income, while the town of Lee notes the least. All four communities have median household income levels below that of the state.

Unemployment figures are presented in Table I.19 for the years 2000, 2009, and 2010, given the recent recession and economic volatility. In 2000, Hampshire County and the state as a whole reported relatively low unemployment rates of 2.2 percent and 2.7 percent, respectively. At the height of the recession in late 2009, the unemployment rate in county tipped 7 percent. By the end of 2010, the rate had declined to 6.6 percent. The town of Westfield documented the highest unemployment in both 2009 and 2010 when compared to the other towns in the profile. Furthermore, Hampshire County reported poverty figures slightly above the state average, with 11.9 percent of the total county population living at or below the poverty line.

Table I.20 gives the employment breakdown by industry for Hampshire County. The largest employer in the county is, overwhelmingly, education, healthcare and social assistance services. This sector accounts for almost 39 percent of total employment in the county. The second largest employer is the retail trade industry, with 10.6 percent of total employment. Rounding out the top three is the arts, entertainment and recreation industry, accounting for 8.6 percent of total employment in the county. Hampshire County's dependence on the education, healthcare and social assistance services is the highest in the Watershed. This is not all that surprising with the county being home to five major college campuses that house a combined student population of over 35,000.

**Table I.20. Employment by Industry in Greater Amherst Sub-Region**

| Full-Time and Part-Time Employment | Greater Amherst Sub-Region Hampshire County |
|---|---|
| Civilian employed pop. (16 years and over) | 80,804 |
| Percent of Employment by Industry (percent) | |
| Agriculture, forestry, fishing and hunting, and mining | 0.8 |
| Construction | 4.9 |
| Manufacturing | 7.9 |
| Wholesale trade | 2.4 |
| Retail trade | 10.6 |
| Transportation and warehousing, and utilities | 3.7 |
| Information | 2.1 |
| Finance and insurance, and real estate | 4.6 |
| Professional, scientific, and mgmt., admin. and waste mgmt. services | 8.0 |
| Education services, health care, and social assistance | 38.8 |

| Full-Time and Part-Time Employment | Greater Amherst Sub-Region<br>Hampshire County |
|---|---|
| Arts, entertainment, and recreation, and accom. and food services | 8.6 |
| Other services, except public administration | 3.8 |
| Public administration | 3.7 |

*Source: U.S. Census Bureau, ACS, 2009.*

**Commodity Industries**
As noted, Hampshire County is in the center of the Pioneer Valley, which is historically known to have some of the most fertile soil and unspoiled forests in all of New England (Pioneer Planning Valley Commission, 2012). The commodity industries, however, have been in decline. Looking at both U.S. Census and Bureau of Economic Analysis data, commodity sector employment is estimated to only account for 0.8-2.46 percent of total employment in the County. Paper-product manufacturing has been especially hit hard, which has had subsequent impacts on timber harvesting companies. In 1993 there were 94 confirmed active sawmills in Massachusetts. As of 2005 there were only 49, which were producing roughly 49 million board feet (Damery et al., 2006). Only seven sawmills and two portable bandmills were registered within Hampshire County in 2005. The town of Lee was a prominent paper mill town in the region, yet has witnessed a drastic decline in its manufacturing. In 1857 there were 25 paper mills operating in Lee town limits. Today, there is only 1 small papermaking facility still in operation; the most recent closure coming in 2008 that put 170 people out of work (CPBIS, 2011; Thompson, 2007).

Much of Hampshire County has roots in agriculture. While the landscape has seen a lot of change over the last century, especially in areas along the Connecticut River, farming operations have maintained a presence in the County. Table I.21 provides the number of farms, total acreage, and the value of agricultural products sold in 2007 at the county and state level.

**Table I.21. Farming in the Greater Amherst Sub-Region**

| Agriculture in the Greater Amherst Sub-Region | # of Farms (2007) | Avg.Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Massachusetts | 7,691 | 67 | 517,879 | -0.1 | 489,820,000 |
| Hampshire County | 711 | 74 | 52,756 | 3.9 | 38,617,000 |

*Source: USDA, Ag. Census, 2002; 2007*

In 2007, Massachusetts' total agricultural production was estimated to have an annual market value of close to $500 million. Agriculture statistics for Hampshire County are fairly proportional; accounting for about 10 percent of total farm acreage in the state, just less than 10 percent of the total number of farms, and about 8 percent of the total annual product value. The county documented roughly a 4 percent increase in farmland acres from 2002-2007.

While farmland statistics are not provided at the community level, the towns along the Connecticut River in this region have historic ties to agriculture. Hadley's agricultural history ranges from broomcorn in the 1700s, tobacco and vegetables in the 1800s, to unofficially being named the asparagus capital of the world in the 1900s (Moore, 2007). However, towns such as Hadley have seen much of their farmland give way to new housing and road expansion associated with the nearby universities and the influx of faculty and students. While expanding, towns in this region such as Northampton have become sites for restaurants that feature the use of local ingredients. Area farm markets are held multiple times a week (Pioneer Planning Valley Commission, 2012). This increase in local demand and accompanying outlets could lead to more agricultural production in the region.

**Recreation and Tourism-Related Industries**
The travel and tourism industry continues to be a significant and growing contributor to the local and regional economies within the Watershed. Total direct spending from annual travel and tourism in Massachusetts in

2009 was estimated at $14.4 billion, supporting over 120 thousand jobs in the state (Massachusetts Department of travel and Tourism, 2010). Of these state figures, Hampshire County was estimated to have experienced $96 million in total direct spending, 830 jobs, and contributed $7.8 million to state and local revenue (Massachusetts Department of travel and Tourism, 2010). Many of the towns within this region of the Watershed are attempting to capture more of this valuable market by hosting annual festivals and cultural events that attract crowds from beyond the community borders. Many of these events are centered on the historic cultural and economic makeup of the region. The town of Northampton has the longest continuously running agricultural fair in the nation (Williamstown Chamber of Commerce, Accessed 2011). Area farmers and artisans are once again finding local markets for their goods, while catering to buyers and their overall experience. Agritourism seems to be expanding at a considerable rate, with Massachusetts having a website and interactive map/brochure with over 400 registered enterprises (MA Dept. of Ag. Resources, 2011).

There are abundant recreation opportunities within Hampshire and surrounding counties. The foothills of the Berkshire Mountains to the west offer up great outdoor experiences. Traditional activities taking place on Refuge lands include fishing, hunting, wildlife observation, photography, and environmental education. Details about the economic contribution associated with wildlife viewing, hunting, and fishing in Massachusetts are provided in Table I.16 in the previous sub-region profile. Other popular activities not accounted for below include a wide variety of water-based recreation. The Connecticut River is popular for both motorized and non-motorized boating and swimming.

**Land Use and Ownership**

A large majority (85 percent) of the landscape in Hampshire County is classified as forest (NASA MODIS, 2006). Additionally, 8 percent is classified as mixed cropland, which is relatively high when compared to the other counties in the larger Watershed analysis. Land classified as residential makes up 65 percent of the total land area in the county (Theobald, 2005; Headwaters Economics EPS-HDT Report, 2011). This represents a 15 percent increase over 1980 levels. A majority of this residential land is classified as 'exurban,' which accounts for lot sizes ranging from 1.7 to 40 acres. Table I.22 displays the breakdown of land ownership in Hampshire County. An overwhelming majority (89.9 percent) of the land in Hampshire County is privately owned. Less than 1 percent of the land is in Federal ownership.

**Table I.22. Land Ownership (acres) in Greater Amherst Sub-Region**

| | Hampshire County, MA |
|---|---|
| **Total Area** | 348,921 |
| **Private Lands** | 313,419 |
| **Federal Lands** | 2,740 |
| **State Lands** | 25,918 |
| **City, County, Other** | 6,844 |

*Source: Conservation Biology Institute, 2006 (As cited by Headwaters Economics EPS-HDT Report, 2011).*

To date, the Refuge has acquired and conserved just over 35,000 acres throughout the Watershed, almost exclusively through fee-acquisitions. Of that total, just over 600 acres are located within Hampshire County. In addition, localized areas around the city of Northampton, Handley, and Amherst have been identified for their high ecological value and possible acquisition potential. An additional, larger tract has been in identified in the western portion of the county. For a comprehensive discussion on the potential impacts of federal fee acquisitions and conservation easements, please reference Section II.

## Greater Hartford Sub-Region

The Greater Hartford Sub-Region within the Watershed consists exclusively of Hartford County, Connecticut. Hartford County, located in the north-central part of the state, is the location of the proposed Pyquag Division of the Refuge. This division consists of 4,085 acres that is yet to be established. The area spans a floodplain that contains freshwater marshes, floodplain forests, and agricultural lands. Hartford County is the most populous county in the Watershed profile and maintains the highest population density. The county is home to the capital city of the state, Hartford. Hartford (city) is recognized to be very dependent on the insurance and financial industries, and has been hard hit by the recent recession. By the end of 2010, the county as a whole had the highest unemployment rate out of the eleven counties included in the Watershed profile.

Three additional Connecticut communities are highlighted in the Greater Hartford Sub-Region profile given the potential influence of Refuge management. These being: East Hartford, Wethersfield, and Windsor Locks. East Hartford and Wethersfield are relatively urban areas that are part of the Greater Hartford Metropolitan Area (1.2 million residents). The town of Windsor Locks serves as a major distribution point due to the presence of the Bradley International Airport. The town is also known for its production of aerospace products as well as paper goods (Town of Windsor Locks, 2014). Cultural and historical museums are abundant in the towns and attract visitors eager to learn about the early years of life in New England.

**Population**

Table I.23 gives the population estimates and trends for the state of Connecticut, Hartford County, and the three towns of interest in the Greater Hartford Sub-Region. The 2010 population of 894,014 makes Hartford County the second most populous in Connecticut, and the most populated in the larger Watershed profile. The population density in Hartford County—1,216 persons per square mile—is more than 2.5 times the next highest density noted in the eleven-county Watershed profile and is considerably higher than the state average of 738 persons per square mile. The population in the county has been steadily increasing for most of the past fifteen years (see Figure I.12).

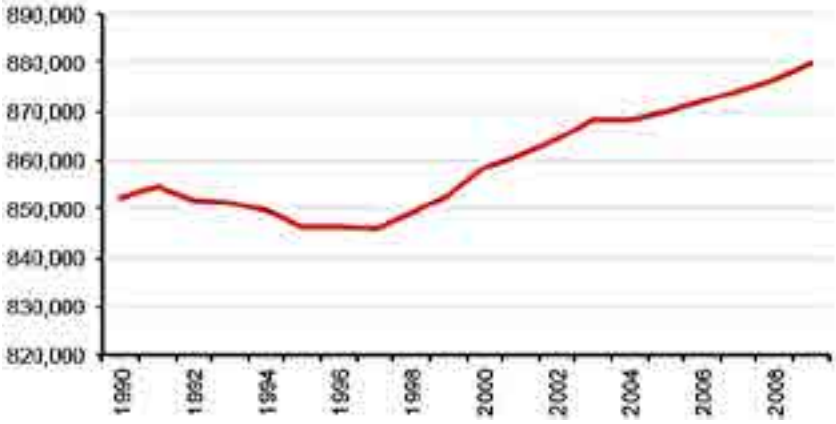
**Table I.23. Population Figures for Greater Hartford Sub-Region**

| Greater Hartford Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Connecticut | 3,574,097 | 39 | 738 | 4,845 | 4.9 | 3,613,583 |
| ***Greater Hartford Sub-Region*** | | | | | | |
| Hartford County (CT) | 894,014 | 39.2 | 1,216 | 735 | 4.3 | 873,647 |
| ***Towns of Interest*** | | | | | | |
| East Hartford, CT | 48,627 | 37.8 | 2,587 | 18.8 | -1.9 | 49,145 |
| Wethersfield, CT | 25,788 | 44.1 | 1,969 | 13.1 | -1.8 | 25,626 |
| Windsor Locks, CT | 12,422 | 41.7 | 1,321 | 9.4 | 3.1 | 13,434 |

*Source: U.S. Census Bureau, 2010; Connecticut State Data Center, 2007;* Note: Resident populations and median age estimates for Towns of Interest were pulled from U.S. Census Bureau's 2005-2009 American Survey 5-year Estimates. Population projections were calculated by the Connecticut State Data Center in 2007 and therefore might be inconsistent with 2010 estimates and recent population change figures.*

The town of Windsor Locks is the least populated town of the three examined, yet experienced a population growth near 3 percent over the last decade. Both East Hartford and Wethersfield documented moderate declines near 2 percent over that same time period. All three towns have population densities over 1,300 people per square mile, making them far more urban than most other areas examined in the Watershed.

**Figure I.12. Regional Population Trends for Hartford County, Connecticut 1980-2008**




*Source: U.S. Department of Commerce, BEA, 2011a.*

In 2010, the U.S. population consisted of 63.7 percent of white persons not of Hispanic or Latino origin (U.S. Census, 2010). Comparatively, Connecticut's state-wide population consisted of 71.2 percent white people. Hartford County lies closer to the national demographic, with 66.1 percent of its population consisting of white people not of Hispanic descent. This demographic for Hartford County is also 20 percent less than any other county in the larger Watershed profile. The majority of residents in Hartford County, 86.5 percent, were born in the U.S. Furthermore, nearly 87 percent of the residents over the age of twenty-four in Hartford County are high school graduates, and close to 33 percent have earned a bachelor's or advanced degree (U.S. Census Bureau, ACS, 2009). These percentages of education attainment are slightly higher than the national average, yet slightly lower than the state-wide average.

**Regional Employment and Income**

The Greater Hartford Sub-Region is more urban than other regions in the analysis and tends to rely less on agriculture and natural commodities than it does the service and retail industries. The capital city of Hartford is even referred to as the "Insurance Capital of the World," as it is home to some of the nation's largest insurance companies (City of Hartford, 2011). Table I.24 shows the median household income, unemployment rates, and percent of the population living in poverty in the state of Connecticut, Hartford County, and the communities of interest.

**Table I.24. Income, Unemployment, and Poverty Rates**

| | Median Household Income (2009 $s) | Percent Unemployed | | | Percent below Poverty (2009) |
|---|---|---|---|---|---|
| | | 2000 | 2009* | 2010* | |
| US | 50,221 | 4.0 | 9.9 | 9.4 | 14.3 |
| Connecticut | 68,294 | 2.3 | 8.4 | 8.6 | 9.3 |
| Hartford County (CT) | 64,045 | 2.5 | 9.1 | 9.1 | 10.1 |
| *Towns of Interest* | | | | | |
| East Hartford | 48,747 | 3.4 | 10.7 | 10.6 | N/A |
| Wethersfield | 70,525 | 2.2 | 8.3 | 8.4 | N/A |
| Windsor Locks | 64,110 | 2.0 | 9.7 | 7.8 | N/A |

*Source: U.S. Bureau of Labor Statistics, 2011; U.S. Census Bureau Quickfacts, 2009. U.S. Census Bureau, ACS, 2009; Connecticut Department of Labor, 2010. (*) Denotes unemployment rates as of December of that year.*

Median household income for Hartford County in 2009 was an estimated $64,045. This figure is roughly $4,000 less than the state median, however $14,000 higher than the national median. There is even more disparity within the three communities of interest in the sub-region. The town of East Hartford reported a median household income of $48,747 in 2009, while the town Wethersfield reported a median of $70,525; a difference of nearly $22,000.

Unemployment figures are presented in Table I.24 for the years 2000, 2009 and 2010, given the recent recession and economic volatility. In 2000, prior to the economic downturn, Hartford County reported relatively low unemployment at 2.5 percent. The county experienced a large spike in 2009 during the financial crisis. By the end of 2010, unemployment in the county remained above 9 percent. This is not entirely surprising as much of the county's economy is supported by service and retail industries that are largely dependent on consumer spending. One note is that the only two counties in the Watershed that did not report a decline in unemployment from 2009-2010 were Hartford, Connecticut and Middlesex, Connecticut—the two most populated counties with the highest median incomes. Of the three communities examined, Windsor Locks has been able to recover the most since the peak of the recession in 2009. By the end of 2010, the unemployment rate in Windsor Locks was down to 7.8 percent. East Hartford has fared the worst, with unemployment at the end December, 2010 still above 10 percent. This ranks above the national average and is the highest rate observed out of any of the towns examined throughout the Watershed.

Table I.25 gives the employment breakdown by industry for Hartford County. The largest employer in the county is the educational, healthcare, and social assistance services, accounting for 24 percent of employment. Finance, insurance and real estate, manufacturing, and retail trade account for 12.4 percent, 11.8 percent and 10.8 percent of employment, respectively. Major businesses and employers in the area include Pratt & Whitney, Coca-Cola, the University of Connecticut, Connecticut Departments of Correction and Motor Vehicles, and the Bradley International Airport. The communities included in this profile are in close proximity to Hartford and house many commuters. They have been gearing portions of their business development around commuters in the region. In turn, local economies within the area are growing more dependent on service and retail industries.

**Table I.25. Employment by Industry in the Greater Hartford Sub-Region**

| Full-Time and Part-Time Employment | Greater Hartford Sub-Region<br>Hartford County |
|---|---|
| Civilian employed pop. (16 years and over) | 432,283 |
| *Percent of Employment by Industry (percent)* | |
| Agriculture, forestry, fishing and hunting, and mining | 0.2 |
| Construction | 5.5 |
| Manufacturing | 11.8 |
| Wholesale trade | 2.9 |
| Retail trade | 10.8 |
| Transportation and warehousing, and utilities | 4.1 |
| Information | 2.5 |
| Finance and insurance, and real estate | 12.4 |
| Professional, scientific, and mgmt., admin. and waste mgmt. services | 9.7 |
| Education services, health care, and social assistance | 24.0 |
| Arts, entertainment, and recreation, and accom. and food services | 7.1 |
| Other services, except public administration | 4.5 |
| Public administration | 4.4 |

*Source: U.S. Census Bureau, ACS, 2009.*

**Commodities, Recreation, and Tourism**
The commodity sectors (Timber, Agriculture, and Mining) only make up 0.73 percent of the total jobs in Hartford County. Timber is the largest component of commodity sector employment in Hartford County; however only accounts for 0.38 percent of total jobs (BEA, 2011). Farm acres, number of farms, and the market value of agricultural products produced are displayed in Table I.26 for the county and state level.

**Table I.26. Farming in the Greater Hartford Sub-Region**

| Agriculture in the Greater Hartford Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | Percent Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Connecticut | 4,916 | 83 | 405,616 | 13.6 | 551,553,000 |
| Hartford County | 790 | 68 | 53,504 | 6.6 | 133,582,000 |

*Source: USDA, Ag. Census, 2002; 2007.*

The state of Connecticut is home to just over 400,000 acres of active farmland, with an annual market value of agricultural products close to $551 million. This ranks Connecticut as having the least amount of farmland acres out of the four states in the Watershed, yet is ranks second in the total market value of agricultural products sold (only to Vermont). Hartford County accounts for about 13 percent of the farmland in Connecticut, but almost 25 percent of the market value of agricultural products sold.

The travel and tourism industry continues to be a significant and growing contributor to the local and regional economies throughout the Watershed. Travel and tourism in Connecticut is estimated to contribute $8 billion to the gross state product annually, which supports 110,000 jobs, or 6.5 percent of the state's workforce (McMillen, 2006). In addition, it is estimated tourism expenditures contribute $1.1 billion in state and local revenue (McMillen, 2006). Travel and tourism account for around 11 percent of the total jobs in Hartford County, with most coming from the accommodation and food services industry (BEA, 2011b). Much of the tourism in Hartford County is centered on the history of the area and surrounding Watershed. With some of the oldest towns in the country, visitors have their choice of visiting multiple museums and various exhibits, while observing the colonial architecture scattered about.

While much more urban than other sub-regions examined in the Watershed, Hartford County still provides many recreation opportunities. Lands acquired by the Refuge traditionally allow recreation activities such as fishing, hunting, wildlife observation, photography, and environmental education to take place. Details about the economic contribution associated with wildlife viewing, hunting, and fishing in the state of Connecticut are provided in Table I.27.

**Table I.27. Recreation Estimates and Expenditures in Connecticut**

| Recreation Estimates | Residents and Non-Residents | Connecticut |
|---|---|---|
| **Fishing** | # of Anglers | 302,000 |
| | Total Expenditures | 243,552,000 |
| | Trip-Related | 130,742,000 |
| | Equipment and Other ($) | 112,810,000 |
| **Hunting** | # of Hunters | 38,000 |
| | Total Expenditures | 68,530,000 |
| | Trip-Related | 5,991,000 |
| | Equipment and Other ($) | 62,539,000 |
| **Wildlife Watching** | Total Participants | 1,170,000 |

| Recreation Estimates | Residents and Non-Residents | Connecticut |
|---|---|---|
| | Total Expenditures | 509,432,000 |
| | Trip-Related | 53,025,000 |
| | Equipment and Other ($) | 456,407,000 |

*Source: USFWS National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 2006.*

**Land Use and Ownership**
As noted earlier, Hartford County is the most populous county in the overall Watershed profile and maintains the highest population density. In 2010, 72.7% of private land was considered residential (Headwater Economics EPS Tool, 2011). Out of the 480,160 acres in the county, 264,000 (55 percent) are considered forest, and 139,246 (29 percent) are noted as an urban land use. Hartford County currently has 91 percent of its land in private ownership, with no documented land in federal ownership (Table I.28).

**Table I.28. Land Ownership (acres) in the Greater Hartford Sub-Region**

| | Hartford County, Connecticut |
|---|---|
| **Total Area** | 480,160 |
| **Private Lands** | 436,813 |
| **Federal Lands** | - |
| **State Lands** | 26,965 |
| **City, County, Other** | 16,382 |

*Source: Conservation Biology Institute, 2008 (As cited by Headwater Economics EPS-HDT Report, 2011).*

To date, the Refuge has acquired and conserved just over 35,000 acres throughout the Watershed, almost exclusively through fee-acquisitions. The Service has proposed plans to purchase what will be the Pyquag Division of the Refuge, through fee acquisition titles with willing sellers. This division is designed around 4,085 acres and encompasses a floodplain that contains freshwater marshes, floodplain forests, and agricultural lands. The proposed land area for the division edges up to the towns of Wethersfield, Glastonbury, and Rock Hill, and is about 7 miles directly south of metropolitan Hartford. For a comprehensive discussion on the potential economic impacts of federal fee acquisitions and conservation easements, please reference Section II.

**Southern Connecticut Sub-Region**
The Southern Connecticut Sub-Region of the Watershed consists of Middlesex County, Connecticut. Middlesex County, located in the south-central part of the state, is the southernmost county in the Watershed, with its southern tip bordering the Long Island Sound. The Salmon River Division of the Refuge is located within the county, encompassing 285 acres that were acquired in 2009. An additional 2,550 acres in the surrounding area have been approved for purchase from willing sellers. The management area includes an extensive freshwater tidal marsh important to migratory waterfowl and anadromous fish species. Settlements and ports within the county were established during colonial times, as explorers traversed up the Connecticut River. The colonial history is apparent and embraced in many parts of the county still today. The county prides itself as a great place to live, work, and recreate, and currently maintains the highest median household income out of any county in the Watershed.

Four Connecticut communities are also examined in the Southern Connecticut Sub-Region profile. These being: East Hampton, Chester, Old Lyme, and Old Saybrook. The towns are in close proximity to the Salmon River Division and have the potential to be influenced by management decisions. Rich with history, all the towns date back to the 1600s and have original roots in farming and early manufacturing in Connecticut. The town Chester has a “picturesque Main Street” with shops and restaurants, but does everything it can to maintain its small

town way of life and natural amenities (Town of Chester, 2011). Old Lyme is a community still rich in the arts, being home to many famous artists and now the location for a fine arts institution and multiple museums. It is a growing 'bedroom' community for people working in the larger urban areas within and even outside the state (Old Lyme, 2011). Both Old Lyme and Old Saybrook are located near the outflow of the Connecticut River into Long Island Sound. The nearby access to both waterways has made it an area with great recreation opportunities and a destination that attracts several thousand vacationers in the summer months each year.

**Population**

Table I.29 gives the population estimates and trends for the state of Connecticut, Middlesex County, and towns of interest in the Southern Connecticut Sub-Region of the Watershed. Both the state of Connecticut and Middlesex County have experienced a steady growth in total population over the last decade. Figure I.13 reveals the population growth in Middlesex County has been consistent since 1990. The 2010 population of 165,676 makes Middlesex County the second-most populous county in the larger Watershed profile. The population density in Middlesex County, 449 persons per square mile, is considerably lower than the state average of 738 persons per square mile. According to state department estimates, these population trends are expected to continue in the coming years (Connecticut State Data Center, 2007).

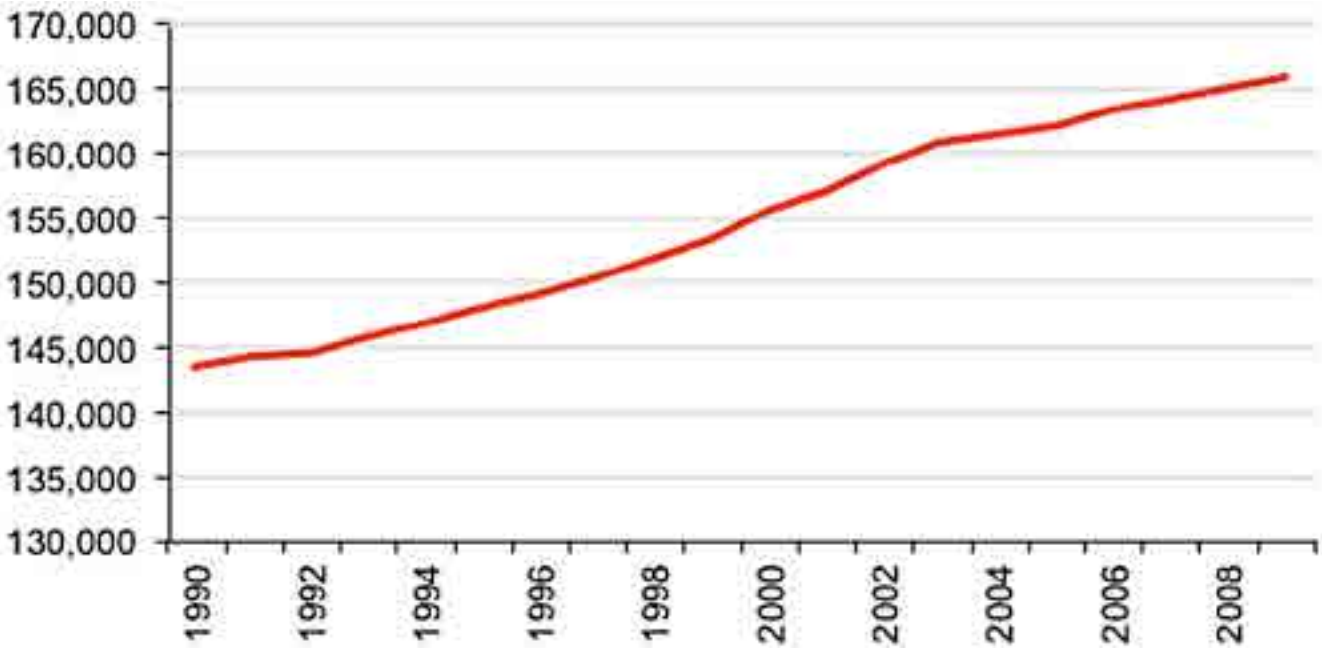
**Table I.29. Population Figures for the Southern Connecticut Sub-Region**

| The Southern Connecticut Sub-Region | Population (2010) | Median Age | Persons per Square Mile | Land Area (Square Miles) | Percent Change in Population 2000-2010 | Population Projection in year 2020 |
|---|---|---|---|---|---|---|
| Connecticut | 3,574,097 | 39 | 738 | 4,845 | 4.9 | 3,613,583 |
| ***Southern Connecticut Sub-Region*** | | | | | | |
| Middlesex County (CT) | 165,676 | 41.3 | 449 | 369 | 6.8 | 174,950 |
| ***Towns of Interest*** | | | | | | |
| Chester, CT | 3,829 | 45 | 228 | 16.8 | 2.2 | 3,908 |
| East Hampton, CT | 12,507 | 41.7 | 340 | 36.8 | -6.3 | 11,762 |
| Old Lyme, CT | 7,419 | 47.1 | 258 | 28.8 | 0.2 | N/A |
| Old Saybrook, CT | 10,517 | 48.6 | 487 | 21.6 | 1.4 | 10,352 |

*Source: U.S. Census Bureau, 2010; Connecticut State Data Center, 2007. * Note resident population and median age estimates for Towns of Interest were pulled from U.S. Census Bureau's 2005-2009 American Community Survey 5-yr. estimates. Population projections were calculated by the Connecticut State Data Center in 2007 and therefore might be inconsistent with 2010 estimates and recent population change figures.*

The towns of Chester, Old Lyme, and Old Saybrook all experienced moderate population growth (under 3 percent) over the last ten years. In contrast, East Hampton documented a 6.3 percent decline in population over the same time period. Three of the four communities of interest all maintain median ages of 45 years or higher, with Old Saybrook being the highest at almost 49 years of age.

**Figure I.13. Population Trends for Southern Connecticut Sub-Region 1990-2008**




*Source: U.S. Department of Commerce, BEA, 2011a.*

In 2010, the U.S. population consisted of 63.7 percent of white persons not of Hispanic or Latino origin (U.S. Census Bureau, 2010). Comparatively, Connecticut's population consisted of 71.2 percent white people. Middlesex County has a larger disparity from the national average, with 86.4 percent white persons not of Hispanic or Latino origin. The majority of residents in the county, 92.7 percent, were born in the U.S. Education attainment figures for the resident population in Middlesex County are also higher than state-wide and national averages. In Middlesex County, around 92 percent of residents over the age of twenty-four are high school graduates and close to 37 percent have earned a bachelor's or advanced degree (U.S. Census Bureau, ACS, 2009).

**Regional Employment and Income**

The Southern Connecticut Sub-Region is more urban than other regions in the analysis and relies less on agriculture and natural commodities than it does the service and retail industries. Table I.30 gives the median household income, unemployment rates, and percentage of the population living in poverty for the state of Connecticut, Middlesex County, and the four communities of interest.

**Table I.30. Income, Unemployment, and Poverty Rates in the Southern Connecticut Sub-Region**

| Full-Time and Part-Time Employment for White River Junction Sub-Region by Industry | WRJ Sub-Region | | |
|---|---|---|---|
| | Orange County | Windsor County | Grafton County |
| Civilian employed pop. (16 years and over) | 15,370 | 29,715 | 44,389 |
| *Percent of Employment by Industry (percent)* | | | |
| Agriculture, forestry, fishing and hunting, and mining | 5.3 | 2.5 | 1.9 |
| Construction | 9.4 | 9.2 | 8.7 |
| Manufacturing | 9.7 | 9.7 | 9.3 |
| Wholesale trade | 2.5 | 2.6 | 1.6 |
| Retail trade | 10.3 | 11.2 | 12.7 |

| Full-Time and Part-Time Employment for White River Junction Sub-Region by Industry | WRJ Sub-Region | | |
|---|---|---|---|
| | Orange County | Windsor County | Grafton County |
| Transportation and warehousing, and utilities | 2.9 | 4.1 | 2.8 |
| Information | 1.5 | 2.1 | 1.4 |
| Finance and insurance, and real estate | 4.7 | 4.8 | 4.5 |
| Professional, scientific, and mgmt., admin. and waste mgmt. services | 8.8 | 9.5 | 7.1 |
| Education services, health care, and social assistance | 30.4 | 25.3 | 33.1 |
| Arts, entertainment, and recreation, and accomd. and food services | 5.5 | 10.1 | 11.0 |
| Other services, except public administration | 3.9 | 4.9 | 3.7 |
| Public administration | 5.1 | 3.8 | 2.1 |

*Source: U.S. Bureau of Labor Statistics, 2011; U.S. Census Bureau Quickfacts, 2009; U.S. Census Bureau, ACS, 2009; Connecticut Dept. of Labor, 2010. (*) Denotes unemployment rates as of December of that year.*

Median household income in 2009 for Middlesex County was $74,965, which is $10,000 higher than any other county in the Watershed, and around $7,000 higher than the state median. The four Southern Connecticut Sub-Region communities all document median household income greater than $80,000.

Unemployment figures are presented in Table I.30 for the years 2000, 2009, and 2010, given the recent recession and economic volatility. At the start of the decade, the state of Connecticut reported relatively low unemployment at 2.3 percent. Likewise, unemployment in 2000 in Middlesex County was estimated at 2 percent. Both the state and Middlesex County experienced spikes in unemployment during the height of the recession in 2009, with even higher rate observed in late 2010. The county also outperformed the state in percentage of residents earning less than the poverty line. In 2009, 5.7 percent of the county's residents earned less than the poverty line, compared with 9.3 percent statewide.

Table I.31 gives the employment breakdown by industry for Middlesex County, Connecticut. The largest employer in the county is the educational, healthcare, and social assistance services, accounting for 24.4 percent of employment. Manufacturing, retail trade, and professional services accounted for 13.7 percent, 10.3 percent and 10.1 percent of employment, respectively.

**Table I.31. Employment by Industry in Southern Connecticut Sub-Region**

| Full-Time and Part-Time Employment | Southern CT Region<br>Middlesex County |
|---|---|
| Civilian employed pop. (16 years and over) | 86,437 |
| *Percent of Employment by Industry (percent)* | |
| Agriculture, forestry, fishing and hunting, and mining | 0.4 |
| Construction | 6.7 |
| Manufacturing | 13.7 |
| Wholesale trade | 2.9 |
| Retail trade | 10.3 |
| Transportation and warehousing, and utilities | 3.7 |
| Information | 2.8 |
| Finance and insurance, and real estate | 9.7 |

| Full-Time and Part-Time Employment | Southern CT Region<br>Middlesex County |
|---|---|
| Professional, scientific, and mang., admin. and waste mang. services | 10.1 |
| Education services, health care, and social assistance | 24.4 |
| Arts, entertainment, and recreation, and accom. and food services | 6.8 |
| Other services, except public administration | 3.9 |
| Public administration | 4.5 |

*Source: U.S. Census, ACS, 2009.*

Many of the local communities in the area of the Salmon River Division have become 'bedroom' communities for people commuting to larger metropolitan areas within, and even outside the state. Middletown, Connecticut is one such city, located along the Connecticut River and home to major employers such as Pratt & Whitney, Aetna, Middlesex Hospital, Connecticut Valley Hospital, Liberty Bank, and Wesleyan University. Similarly, it is noted East Hampton has both the smallest jobs to housing ratio and the smallest jobs to worker ratio among neighboring communities. East Hampton's ratios indicate that there are nearly three times more homes than jobs and nearly four times as many residents in the workforce than jobs available in the town, marking East Hampton as a bedroom community and source of labor for surrounding communities (East Hampton Plan of Conservation & Development, 2001). Many of the smaller towns are gearing their business development around these commuters, along with relying on the influx of visitors and second-home owners in the summer months. In turn, local economies within the area are growing more dependent on service and retail industries.

**Commodities, Recreation and Tourism**

Only 1.3 percent of total employment within Middlesex County is in the commodity sectors (Timber, Agriculture, and Mining) (BEA, 2011b). Commodity production and related industry has been further stressed by development pressures and population growth in the county. Agriculture is the largest component of commodity sector employment in Middlesex County; however this sector accounts for only 0.79 percent of total jobs (BEA, 2011b). Farm acres, number of farms, and the market value of agricultural products produced are displayed in Table I.32 for the county and state.

**Table I.32. Farming in the Southern CT Sub-Region**

| Agriculture in the Southern Connecticut Sub-Region | # of Farms (2007) | Avg. Farm Size (acres) (2007) | Farm Acres (2007) | % Change in Farmland Acres (2002-2007) | Mkt. Value of Ag. Products Sold ($) |
|---|---|---|---|---|---|
| Connecticut | 4,916 | 83 | 405,616 | 13.6 | 551,553,000 |
| Middlesex County | 393 | 42 | 16,623 | -6.6 | 55,753,000 |

*Source: USDA, Ag. Census, 2002, 2007.*

The State of Connecticut has the least amount of farmland acres out of the four states in the Watershed, yet is ranks second in the total market value of agricultural products sold (only to Vermont). Middlesex County experienced a slight decline in active farmland acres from 2002-2007, and now accounts for roughly 4 percent of the state's total acreage in agricultural production. While farmland statistics are not provided at the community level, there are ties to the farming industry within the communities of interest. Old Saybrook is a coastal city, allowing it to serve as a central hub for merchants as well as grain milling prior to modernization (Town of Old Saybrook, 2011). Chester, East Hampton and Old Lyme all began as land grants on which the early settlers farmed and raised livestock.

There are a variety of recreation opportunities in Middlesex County. The Connecticut River spans the length of the county and is a prominent source and site of recreation. Traditional recreation activities on lands under Refuge management include fishing, hunting, wildlife observation, photography, and environmental education. The southern location of towns like Old Saybrook allow for other opportunities like spending time at the beach and ocean-based recreation. Details about the economic contribution associated with wildlife viewing, hunting, and fishing in Connecticut are provided in Table I.27 in the previous sub-region profile.

Direct spending in Connecticut by travelers and tourists is estimated at around $9.1 billion each year, and accountable for 110 thousand jobs in the state (McMillen, 2006). Travel and tourism account for about 14 percent of the total jobs in Middlesex County, with most coming from the accommodation and food services industry (BEA, 2011b). Many of the towns within the county rely heavily on the influx of tourist and vacationers, especially during the summer months. The coastal towns of Old Lyme and Old Saybrook experience a surge in seasonal residents and visitors during the 14 weeks of summer that more than doubles their year-round population. Towns located further inland such as East Hampton and Chester continue to embrace the historic charm and roots of the area, offering tourism experiences centered on the historic cultural and economic makeup of the region.

**Land Use and Ownership**

As noted previously, Middlesex County is more populated and developed when compared to other counties in the Watershed further north. However, 87 percent of its landscape is still considered forested (NASA MODIS, 2006). As of 2010, 62.5 percent of the residential land in Middlesex County was considered to be 'exurban' residential, in which lot sizes averaged between 1.7 and 40 acres (Theobald, 2005; Headwaters Economics EPS-HDT Tool and Reports, 2011). Middlesex County has only 309 acres in federal ownership, representing only 0.1 percent of the total land area in the county (see Table I.33). The 31,545 acres of state-owned public lands in Middlesex County accounts for around 11 percent of the total land area.

**Table I.33. Land Ownership (acres) in the Southern Connecticut Sub-Region**

| | Middlesex County, Connecticut |
|---|---|
| Total Area | 280,882 |
| Private Lands | 211,624 |
| Federal Lands | 309 |
| State Lands | 31,545 |
| City, County, Other | 2,596 |

*Source: Conservation Biology Institute, 2008 (As cited by Headwaters Economics EPS-HDT Report, 2011).*

To date, the Refuge has acquired and conserved just over 35,000 acres throughout the Watershed, almost exclusively through fee-acquisitions. The Salmon River Division of the Refuge is located within Southern Connecticut Region, encompassing 285 acres that were acquired in 2009. An additional 2,550 acres in the surrounding area have been approved for purchase from willing sellers. Refuge personnel have identified additional lands along the Connecticut River and in the western portions of the county for their high ecological values and as potential acquisition sites. For a comprehensive discussion on the potential impacts of federal fee acquisitions and conservation easements, please reference Section II.

## Section II: Current Trends, Objectives, and Potential Impacts of Land-Use Change

The 1995 environmental impact statement (EIS) creating the Silvio O. Conte National Fish and Wildlife Refuge (Refuge) approved acquisition of 78,395 acres within 65 special focus areas (SFAs) in the Connecticut River Watershed (Watershed). Presently, the Silvio O. Conte National Fish and Wildlife Refuge encompasses over 35,000 acres, most of which has been acquired in fee title. A vast majority—26,381 acres—is located in the Nulhegan Basin Division, located in Essex County, Vermont. Within the eleven Watershed counties included in the larger profile analysis, over 81 percent of the total acreage is in private ownership, with 44 percent of this land zoned as residential. This represents a 26 percent increase in residential lands in the region since 1980 (Headwaters Economics EPS). Nonetheless, the vast majority (88 percent as of 2006) of the lands in the larger region remain classified as forested land cover (NASA, 2006).

Changes in technology have dramatically changed the economic dynamics of farming, forestry, and real estate development while generational succession of landowners has changed the pattern of land use and management in the Watershed. A commonly observed trend is for habitat fragmentation to be preceded by ownership fragmentation. Ownership fragmentation has increased in a majority of the Watershed. As ownership changes overtime, land parcels typically become smaller and become more susceptible to conversion for development and other uses. A major focus of the refuge conservation proposal is to protect and assemble larger contiguous habitats along latitudinal and elevation gradients in an effort to counter ownership and habitat fragmentation. In doing so, the Refuge hopes to promote connectivity in area, elevation, latitude, and aspect. The overall objectives

of the land acquisition proposals include building on the 1995 EIS goals to protect federally listed and candidate species, rare or exemplary natural communities, important fisheries habitat, important and vulnerable wetlands, and landbird and waterbird breeding and migratory stopover habitat. Other long-term goals in the proposal are to:

- Maintain the diversity of habitat types in the Watershed to support healthy populations of fish and wildlife;
- Conserve sizable core areas nested within the larger matrix of conserved lands to protect biological integrity and ecosystem health, and contribute to ecosystem services;
- Distribute and connect conserved lands across elevation and latitude gradients in the Watershed with consideration to habitat resiliency and redundancy in anticipation of impacts from climate and land use changes.

Currently, the Service is considering expanding the Refuge's total acreage under ownership through additional fee and easement acquisitions. These transactions are typically in the form of a one-time payment. A transaction of this type and shift in private to public landownership can have an assortment of economic impacts. Some examples include effects to the local tax base and adjoining revenues, the amount of municipal services required, spillover property value impacts, and various dynamics with development in the region. The effect of fee acquisitions on local government revenue is complex and speculative. Many variables are at play, often requiring time to unfold. While there may be some upfront reductions in local tax revenues, reduced dependence on municipal services could more than counter these losses. Other unknowns, such as relocation and spending decisions, and property enhancement effects, will ultimately determine the extent of the economic and fiscal impacts within the region. While these relationships are identified and discussed, estimating these impacts quantitatively requires a large degree of speculation and is beyond the scope of this analysis.

The sale of interest in land (fee and easement) will provide the original landowner with additional revenue following the sale. The landowner might go on to spend some percentage of the funds from their equity in the property in the regional economy, including new real estate investment in the local area. This spending activity can directly impact local industries such as construction and various service sectors, with additional indirect impacts to follow suit. Contrarily, these types of economic impacts could be relinquished if former landowners emigrate outside the region. There is also the possibility of removing a production practice on the land parcel, such as farming or forestry, which could have negative economic consequences. These, too, could be negated by the expenditures required for habitat restoration and stewardship fronted by the Service once acquired. As indicated, there are many dynamic relationships at play that ultimately determine net economic impacts to the local and regional economies.

There are also many dynamic variables at play when considering effects to local tax revenues. Property taxes constitute the largest source of local governments' own revenue (Urban Institute and Brookings Institution, 2008). Lands acquired by the Service would be exempt from local property taxation. However, under provisions of the Refuge Revenue Sharing (RRS) Act, local townships and/or counties receive an annual payment for lands that have been purchased by full fee simple acquisition by the Service. Payments are based on the greatest of 25 percent of net receipts[1], 75 cents per acre, or 0.75 percent of the market value[2] of lands acquired by the Service. The exact amount of the annual payment depends on Congressional appropriations, which has tended to be less than the amount to fully fund the authorized level of payments, and has been progressively declining. In fiscal year (FY) 2011, actual RRS payments were 21.6 percent of authorized levels.

Lands acquired by the Service through fee acquisition would lose their development potential in perpetuity. While this could affect local property tax and income tax revenues, conserved and protected land requires fewer municipal services. New and existing residential developments require local governments to provide services such as fire protection, police services and schools, and to construct new infrastructure such as roads, waste treatment facilities, and water and electrical delivery systems. Providing such services can be very expensive for municipalities in rural settings with a relatively low tax base. A majority of studies conducting community services analysis have concluded land in residential use requires more service expenditures (paid by the municipality) than it generates in tax revenues. Additionally, these studies have typically found land classified as open space to provide a net gain in local revenues. Table I.34 below highlights the revenue-to-expenditure findings

[1] Revenues are derived from the sale or disposition of products (e.g., timber and gravel), privileges (e.g., right-of-way and haying/grazing permits), and/or leases for public accommodations or facilities (e.g., oil and gas exploration and development) providing economic activities incidental to, and not in conflict with, refuge purposes.

[2] Updated appraisals of Refuges are to be completed every 5 years to determine the market value.

from service studies done for eleven towns in New Hampshire. A revenue-to-expenditure ratio of 1:1.30 translates to the town receiving $1 in revenue for every $1.30 it has to spend on that land use. Or in other words, for every $10,000 in property tax and other revenues the town receives from that land use, it spends $13,000 in providing services to it.

**Table I.34. Revenue-to-Expenditure Ratios by Land Use in New Hampshire Communities Studied**

| New Hampshire Community | Residential Land Use (including farm houses) | Commercial & Industrial | Working & Open Land | Source |
|---|---|---|---|---|
| Brentwood | 1 : 1.17 | 1 : 0.24 | 1 : 0.83 | Brentwood Open Space Task Force, 2002 |
| Deerfield | 1 : 1.15 | 1 : 0.22 | 1 : 0.35 | Auger, 1994 |
| Dover | 1 : 1.15 | 1 : 0.63 | 1 : 0.94 | Kingsley, et al., 1993 |
| Exeter | 1 : 1.07 | 1 : 0.40 | 1 : 0.82 | Niebling, 1997 |
| Fremont | 1 : 1.04 | 1 : 0.94 | 1 : 0.36 | Auger, 1994 |
| Groton | 1 : 1.01 | 1 : 0.12 | 1 : 0.88 | New Hampshire Wildlife Federation, 2001 |
| Hookset | 1 : 1.16 | 1 : 0.43 | 1 : 0.55 | Innovative Natural Resource Solutions, 2008 |
| Lyme | 1 : 1.05 | 1 : 0.28 | 1 : 0.23 | Pickard, 2000 |
| Milton | 1 : 1.30 | 1 : 0.35 | 1 : 0.72 | Innovative Natural Resource Solutions, 2005 |
| Mont Vernon | 1 : 1.03 | 1 : 0.04 | 1 : 0.08 | Innovative Natural Resource Solutions, 2002 |
| Stratham | 1 : 1.15 | 1 : 0.19 | 1 : 0.40 | Auger, 1994 |

*Source: American Farmland Trust, 2010.*

As noted earlier, there is also the chance for land acquisition to spur development in other areas within the region as private landowners relocate and new residents are attracted by the publically conserved natural landscape and the almost guaranteed opportunities for compatible outdoor recreation. It is well documented that open space carries positive values to local residents and communities, as well as passers-by (McConnell and Walls, 2005). This is evidenced by the success of open space preservation ballot initiatives at the local, county, and state levels. Banzhaf et al. (2006) point out that between 1997 and 2004, over 75 percent of the more than 1,100 referenda on open space conservation that appeared on ballots across the U.S. passed, most by a wide margin. Accessibility to outdoor trails and park usage can be prime attractions to new homebuyers (National Park Service, 1995). It is also well documented that open space and protected natural areas can increase surrounding property values; that is properties in the vicinity of parks and preserved open space can have higher property values than those not in the vicinity (see McConnell and Walls, 2005, for a comprehensive review). In essence, the real estate market is quantifying the demand and desirability of land that is nested within or adjacent to a conservation mosaic. For example, an analysis of properties surrounding multiple parks in Worchester, Massachusetts, revealed, on average, a house located 20 feet from a park sold for $6,445 (converted to 2012 dollars) more than a similar house located 2,000 feet away (More et al., 1982). Another study that was conducted in the early 90's in Maryland showed that preserving a significant amount of forest land accounted for anywhere from four to ten percent of the value of houses within one mile of the site, in three different counties (Curtis, 1993; Crompton, 2000).

The reciprocating value of open space on property values will vary depending on landscape characteristics and location attributes (e.g. distance to the conserved area) (Kroeger, 2008). Permanence of the open space is also an influencing factor. Typically, open space that is permanently protected (such as refuge lands) will generate a higher enhancement value of local properties than land that has the potential for future development. A study done by Goeghegan (2002) in a suburban county in Maryland shows that permanently protected open space generates a property enhancement value of over three times that of developable open space. Irwin (2002) conducted a similar analysis (in context and location) and found that protected open space increases residential property values by between 0.6 percent and 1.9 percent more in absolute terms than developable open space. As noted, location and demographic factors in the region can influence the relative level of property enhancement

value. For instance, open space may generate larger amenity premiums for property in a more urbanized area and where median incomes are higher (see Netusil et al., 2000); that is not to say there isn't the chance for property values to increase substantially in rural areas as well (see Phillips, 2000; Crompton, 2001; Vrooman, 1978; Thorsnes, 2002).

King and Anderson (2004) examined the marginal property tax effects of conservation easements—representing a similar loss of development rights, but without any county payments—in 29 Vermont towns. Their analysis found conservation easements do slightly raise marginal property tax rates in the short run (2-3 years after conservation), as the overall tax base is lessened and bares more of the tax burden. However, in the long run (6-8 years after conservation) they found conservation easements to be tax-neutral or even tax-suppressing as nearby property values increased.

Furthermore, protected open space is a public good that generates many benefits for local residents, communities, and governments. Protected open space can protect values associated with biodiversity and wildlife abundance, maintain aesthetic beauty, and protect traditional, social, and culturally significant features of landscapes and livelihoods (Holdren & Ehrlich 1974; Ehrlich & Ehrlich 1992; Daily et al. 1997; MEA 2005). Ecosystem services, such as water purification, oxygen production, pollination, and waste breakdown, are also maintained for local residents through protected open space (MEA 2005). Some of these services provided by the landscape can reduce the need for certain municipal services (ex. expanding or building new waste treatment facilities). A primary public benefit of U.S. Fish and Wildlife Service acquisitions is enhanced and preserved wildlife habitat. As development stressors increase over time, many key off-refuge habitat areas may become less available due to conversion to non-wildlife habitat uses. Unlike goods derived from natural resources that are traded in a traditional market setting, many of the benefits from land conservation, such as ecosystem services and intrinsic worth, can be difficult to quantify and value monetarily. We do not attempt to provide estimates of non-market values for this assessment; however, they can be significant in some cases.

## Section III: Economic Impacts of Current and Proposed Management Activities

### Methods for a Regional Economic Impact Analysis

Economic input-output models are commonly used to determine how economic sectors will and will not be affected by demographic, economic, and policy changes. The economic impacts of the management alternatives for the Silvio O. Conte NWR were estimated using IMPLAN (Impact Analysis for Planning), a regional input-output modeling system developed by the U.S. Forest Service. IMPLAN is a computerized database and modeling system that provides a regional input-output analysis of economic activity in terms of 10 industrial groups involving more than four hundred economic sectors (Olson and Lindall, 1999). The IMPLAN model draws upon data collected by the Minnesota IMPLAN Group from multiple federal and state sources including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the U.S. Census Bureau. The year 2009 IMPLAN data profiles for each county in the study area were used in this study. The IMPLAN county level employment data estimates were found to be comparable to the US Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System data for the year 2009 (Olson and Lindall, 1999).

For this analysis, IMPLAN models were developed for the four sub-regions where land is currently managed by the Refuge (Northern, Tri-State Border, Greater Amherst, and Southern Connecticut). The Northern Sub-Region model included Essex and Coos Counties, NH and Caledonia and Orleans Counties, VT. Though the Refuge is not actively managing land in Caledonia or Orleans counties, these counties along with Essex County, NH make up what is known as the Northeast Kingdom where much trade occurs and, as a whole, it serves as an important source of goods and services for the Refuge. The Tri-State Border model consisted of Windham and Franklin Counties, VT and Cheshire County, NH. The Greater Amherst Sub-Region model analyzed Hampshire County, MA and the Southern Connecticut Sub-Region model analyzed the Refuge's impacts in Middlesex County, CT. The White River Junction (Orange County, VT and Windsor and Grafton Counties, NH) and Greater Hartford (Hartford County, CT) Sub-Regions are areas of projected expansion for the Refuge, across the 4 alternatives. IMPLAN models were not developed for these two sub-regions, as land is not currently being managed by the Refuge. IMPLAN modeling was used to show only the current effects of Refuge management. The economic impacts of the alternatives are presented qualitatively and have been discussed across all six sub-regions as expansion into the White River Junction and Greater Hartford Sub-Regions is expected under all proposed alternatives.

Regional economic impact analyses capture the complex interactions of consumers and producers of goods and services in local economies. Economies are complex webs of interacting consumers and producers in which

goods produced by one sector of an economy become inputs to another, and the goods produced by that sector can become inputs to yet other sectors. Thus, a change in the final demand for a good or service can generate a ripple effect throughout an economy. For example, if more visitors come to an area, local businesses will purchase extra labor and supplies to meet the increase in demand for additional services. The income and employment resulting from visitor purchases from local businesses represent the direct effects of visitor spending within the economy. Direct effects measure the net amount of spending that stays in the local economy after the first round of spending; the amount that doesn't stay in the local economy is termed a leakage (Carver and Caudill, 2007). In order to increase supplies to local businesses, input suppliers must also increase their purchases of inputs from other industries. The income and employment resulting from these secondary purchases by input suppliers are the indirect effects of visitor spending within the economy. Employees of the directly affected businesses and input suppliers use their incomes to purchase goods and services. The resulting increased economic activity from new employee income is the induced effect of visitor spending. The indirect and induced effects are known as the secondary effects of visitor spending. "Multipliers" (or "response coefficients") capture the size of the secondary effects, usually as a ratio of total effects to direct effects (Stynes, 1998). The sums of the direct and secondary effects describe the total economic impact of visitor spending in the local economy.

The CCP provides long range guidance and management direction to achieve Refuge purposes over a 15-year timeframe. The economic impacts provided in this report are a reflection of the Refuge's current activities and are reported on an annual basis in 2012 dollars. There are many dynamic variables at play when considering the social and economic effects of conservation easement acquisitions, especially given that potential purchases may span decades. Due to future uncertainty surrounding such factors as the likelihood and timing of land acquisitions, the availability of Service funds to purchase lands, land values, and agricultural/forestry commodity markets, the economic effects of land acquisitions, cannot be quantified. As the effects of the proposed management alternatives are highly dependent on future land acquisitions, the effects have not been quantified, but are instead discussed qualitatively in this report. The projected impacts of the alternatives were not analyzed as large management changes often take several years to achieve and land acquisition can be highly variable and speculative. Regional economic effects from the IMPLAN model are reported for the following economic measures:

**Employment** represents the change in the number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include full time, part time, and temporary jobs.

**Labor Income** includes employee wages and salaries, including income of sole proprietors and payroll benefits.

**Value Added** measures contribution to Gross Domestic Product (GDP). Value added is equal to the difference between the amount an industry sells a product for and the production cost of the product, and is thus net of intermediate sales.

## Refuge Administration

### Purchase of Goods and Services within Sub Regions

The Refuge purchases a wide variety of supplies and services for operation and maintenance activities, and many of these supplies and services are purchased within the local area of each sub-region. Service purchases made within each sub-region contribute to the local economic impacts associated with the Refuge. In the Northern Sub-Region, the majority (approximately 80%) of non-salary expenditures are spent on cooperative agreements to fund the Youth Conservation Corp program, environmental programs and a mobile environmental education center. In both the Tri-State Border and Greater Amherst Sub-Regions, the majority of non-salary expenditures are spent on overhead and administration costs, while in the Southern Connecticut Sub-Region a majority of the expenditures are spent on habitat and grounds improvements.

Currently, non-salary Refuge expenditures total approximately $248,000 in the Northern Sub-Region, $95,000 in the Tri-State Border Sub-Region, $27,000 in the Greater Amherst Sub-Region, and $2,000 in the Southern Connecticut Sub-Region. To determine the local economic impacts of non-salary expenditures, only expenditures made within the local area are included in the analysis. The economic impacts associated with current non-salary Refuge expenditures were estimated using IMPLAN and are summarized in Table I.35. Across all four sub-regions, total Refuge spending generates an estimated 2 jobs, $57,100 in labor income and $73,900 and in value added.

**Table I.35. Average Annual Impacts of Current Non-Salary Spending**

| | Employment (# full & part time jobs) | Labor Income ($2012) | Value Added ($2012) |
|---|---|---|---|
| **Northern Sub-Region** | | | |
| Direct effects | < 1 | $25,400 | $30,300 |
| Secondary effects | < 1 | $8,500 | $14,500 |
| Total effect | < 1 | $33,900 | $44,800 |
| **Tri-State Border Sub-Region** | | | |
| Direct effects | < 1 | $8,800 | $10,000 |
| Secondary effects | < 1 | $3,500 | $5,900 |
| Total effect | < 1 | $12,300 | $15,900 |
| **Greater Amherst Sub-Region** | | | |
| Direct effects | < 1 | $6,700 | $7,300 |
| Secondary effects | 0 | $2,200 | $3,800 |
| Total effect | < 1 | $8,900 | $11,100 |
| **Southern Connecticut Sub-Region** | | | |
| Direct effects | < 1 | $1,500 | $1,300 |
| Secondary effects | 0 | $500 | $800 |
| Total effects | < 1 | $2,000 | $2,100 |
| **Total Effects Across Regions** | | | |
| Direct effects | 1 | $42,400 | $48,900 |
| Secondary effects | < 1 | $14,700 | $25,000 |
| Total effect | 2 | $57,100 | $73,900 |

Refuge personnel estimate that under Alternative A, non-salary expenditures will decrease in both the Northern and Tri-State Border Sub-Regions, by $8,500 and $63,000, respectively. Non-salary expenditures are expected to increase across the remaining sub regions. Within the Greater Amherst and Southern Connecticut Sub-Regions, expenditures are expected to increase by nearly $30,000 and $26,000, respectively. Currently, the Refuge does not spend money in the White River Sub-Region or the Greater Hartford Sub-Region as lands are not actively managed in these areas. Under Alternative A, the Refuge is expected to spend approximately $4,000 in the White River Sub-Region and nearly $40,000 in the Greater Hartford Sub-Region. All non-salary expenditures will be highly dependent on land acquisitions and therefore estimates of future expenditures are speculative and have not been modeled.

**Refuge Personnel Salary Spending**

Refuge employees reside and spend their salaries on daily living expenses in communities within each sub-region, thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals and households to industries for goods and services used for personal consumption. Salary expenditures made by Refuge personnel contribute to the local economic impacts associated with the Refuge. This section presents an analysis of the economic impacts to the four sub-regions of current Refuge personnel salary expenditures.

Currently, Refuge salaries total over $1.21 million per year across all four sub-regions. The Greater Amherst Sub-Region receives a majority of the funds, with an average of $550,500 spent annually in the region. Salary expenditures in the Northern Sub-Region and Tri-State Border Sub-Region total $266,500 and $397,100, respectively. Currently, funds are not allocated to the Southern Connecticut Sub-Region for Refuge personnel

salaries. The IMPLAN modeling system contains household income consumption spending profiles that account for average household spending patterns by income level. These profiles also capture average annual savings and allow for leakage of household spending to outside the region. The IMPLAN household spending pattern for households earning $75-100 thousand per year was used to reflect the average salary of full-time permanent employees at the Refuge while the spending pattern for households earning less than $10 thousand per year was used for the students enrolled in the Youth Conservation Corps (YCC) summer program. The YCC program occurs in the Northern Sub-Region and Greater Amherst Sub-Region.

The economic impacts associated with spending of salaries in the four sub-regions by Refuge employees are summarized in Table I.36. These impacts only include secondary effects on non-Refuge jobs created as Refuge employees spend their salaries in the four sub-regions. Currently, salary spending by Refuge personnel generates secondary effects (i.e., additional non-Refuge jobs in the local economy) of 8 jobs, $283,200 in labor income and $507,400 in value added, across all four sub-regions.

**Table I.36. Average Annual Impacts of Current Refuge Personnel Salary Spending**

| | Employment (# full & part time jobs) | Labor Income ($2012) | Value Added ($2012) |
|---|---|---|---|
| **Northern Sub-Region** | | | |
| **Direct effects** | 0 | $0 | $0 |
| Secondary effects | 2 | $52,000 | $95,100 |
| Total effect | 2 | $52,000 | $95,100 |
| **Tri-State Border Sub-Region** | | | |
| **Direct effects** | 0 | $0 | $0 |
| Secondary effects | 3 | $92,800 | $167,900 |
| Total effect | 3 | $92,800 | $167,900 |
| **Greater Amherst Sub-Region** | | | |
| **Direct effects** | 0 | $0 | $0 |
| Secondary effects | 3 | $138,400 | $244,400 |
| Total effect | 3 | $138,400 | $244,400 |
| **Southern Connecticut Sub-Region** | | | |
| **Direct effects** | 0 | $0 | $0 |
| Secondary effects | 0 | $0 | $0 |
| Total effect | 0 | $0 | $0 |
| **Total Effects Across Regions** | | | |
| **Direct effects** | 0 | $0 | $0 |
| Secondary effects | 8 | $283,200 | $507,400 |
| Total effect | 8 | $283,200 | $507,400 |

Under Alternatives A and B, staffing would remain the same within the Northern, Tri-State Border, Greater Amherst and Southern Connecticut sub-regions. Under these two alternatives, new staff would not be hired in the White River Sub-Region or the Greater Hartford Sub-Region. Under Alternatives C and D, an additional 10 positions are projected for the Tri-State Border Sub-Region and 6 additional positions are projected for the Northern Sub-Region. Similarly to Alternatives A and B, under Alternatives C and D, new staff will not be hired in the White River or Greater Hartford Sub-Regions. The hiring of new staff will be dependent on budgets and will vary depending on availability of funds. Additionally, it is not known in which sub-region new staff will live and subsequently spend their salaries and as a result, the economic impacts of new staff cannot be reasonably allocated to a specific region to be modeled.

**Refuge Revenue Sharing**
The Fish and Wildlife Service (FWS) makes revenue sharing payments to the counties for the land that is under administration. Under provisions of the Refuge Revenue Sharing (RRS) Act, local counties receive an annual payment for lands that have been purchased by full fee title acquisition by the FWS. Payments are based on the greater of 75 cents per acre or 0.75% of the fair market value. The exact amount of the annual payment depends on Congressional appropriations, which in recent years have tended to be substantially less than the amount required to fully fund the authorized level of payments. In fiscal year 2011, RRS payments were appropriated at only 21.6% of the approved value. All four sub-regions where land is currently managed by the Refuge, the Northern, Tri-State Border, Greater Amherst and Southern Connecticut Sub-Regions, receive RRS payments. The majority of RRS payments were made to the Northern Sub-Region, $27,500, while the Tri-State Border, Greater Amherst, and Southern Connecticut Sub-Regions received approximately $2,100, $8,200, and $2,700, respectively.

Table I.37 shows the impacts of the $40,500 received by the four sub-regions in RRS payments. The RRS payments generate an estimated total impact of less than 1 job, $22,200 in labor income and $28,900 in value added.

**Table I.37. Annual Impacts of Current RRS Payments**

| | Employment (# full & part time jobs) | Labor Income ($2012) | Value Added ($2012) |
|---|---|---|---|
| **Northern Sub-Region** | | | |
| **Direct effects** | < 1 | $11,900 | $14,200 |
| Secondary effects | < 1 | $2,400 | $4,200 |
| Total effect | < 1 | $14,300 | $18,400 |
| **Tri-State Border Sub-Region** | | | |
| **Direct effects** | 0 | $900 | $1,100 |
| Secondary effects | 0 | $200 | $400 |
| Total effect | 0 | $1,100 | $1,500 |
| **Greater Amherst Sub-Region** | | | |
| **Direct effects** | < 1 | $3,700 | $4,400 |
| Secondary effects | 0 | $1,000 | $1,700 |
| Total effect | < 1 | $4,700 | $6,100 |
| **Southern Connecticut Sub-Region** | | | |
| **Direct effects** | 0 | $1,700 | $2,000 |
| Secondary effects | 0 | $400 | $800 |
| Total effect | < 1 | $2,100 | $2,800 |
| **Total Effects Across Regions** | | | |
| **Direct effects** | < 1 | $18,200 | $21,800 |
| Secondary effects | < 1 | $4,000 | $7,100 |
| Total effect | < 1 | $22,200 | $28,900 |

The RRS payments may change in the future, given additional land acquisitions. There is much uncertainty regarding the time of acquisitions as well as the location and thus, future RRS payments have not been estimated.

**Refuge Visitor Spending**
Spending associated with recreational visits to national wildlife refuges generates significant economic activity. The FWS report Banking on Nature: The Economic Benefits of National Wildlife Refuge Visitation to Local

Communities, estimated the impact of national wildlife refuges on their local economies (Carver and Caudill, 2007). According to the report, more than 34.8 million visits were made to national wildlife refuges in FY 2006 which generated $1.7 billion of sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife visitors generated nearly 27,000 jobs, and over $542.8 million in employment income (Carver and Caudill, 2007). Approximately eighty-two percent of total expenditures were from non-consumptive activities, twelve percent from fishing, and six percent from hunting (Carver and Caudill, 2007).

This section focuses on the local economic impacts associated with Refuge visitation. Silvio O. Conte National Wildlife Refuge offers a wide variety of recreation opportunities including wildlife observation and photography, interpretation, environmental education, hunting and fishing. Annual visitation estimates for the Refuge are based on several Refuge statistic sources including: visitors entering the Visitor Center/Office and general observation by Refuge personnel. Annual visitation estimates are on a per visit basis. Table I.38 summarizes estimated visitation by type of visitor activity across the Northern, Tri-State Border, Greater Amherst and Southern Connecticut sub-regions.

**Table I.38. Estimated Current Annual Visitation to Refuge Across Sub-Regions**

| Visitor Activity | Total number of visits to the Northern Sub-Region | Total number of visits to the Tri-State Border Sub-Region | Total number of visits to the Greater Amherst Sub-Region | Total number of visits to the Southern Connecticut Sub-Region | Total number of visits across sub-regions | Number of non-local visitor days across sub-regions[a] |
|---|---|---|---|---|---|---|
| *Consumptive Uses:* | | | | | | |
| Fishing | 150 | 10 | 25 | 25 | 210 | 26 |
| Hunting: Big Game | 770 | 10 | 10 | 20 | 810 | 401 |
| Hunting: Waterfowl | 15 | 0 | 5 | 5 | 25 | 5 |
| Hunting: Migratory Birds | 250 | 0 | 30 | 20 | 300 | 100 |
| Hunting: Upland Game | 715 | 30 | 50 | 50 | 845 | 409 |
| *Non-Consumptive Uses:* | | | | | | |
| Nature trails/auto tour/other wildlife observation/ office visits | 20,000 | 7,884 | 300 | 100 | 28,284 | 3,511 |
| Total Visitation | 21,900 | 7,934 | 420 | 220 | 30,474 | 4,451 |

[a] *One visitor day = 8 hours.*

Visitor spending profiles are estimated on an average per day (8 hours) basis. Because some visitors only spend short amounts of time visiting a refuge, counting each refuge visit as a full visitor day would overestimate the economic impact of Refuge visitation. In order to properly account for the amount of spending, the annual number of non-local refuge visits were converted to visitor days. Refuge personnel estimate that non-local anglers spend approximately 4 hours (1/2 a visitor day) on the Refuge, while migratory, waterfowl and upland game hunters spend approximately 6 hours (3/4 a visitor day) and non-local big game hunters spend approximately 8 hours (1 visitor day) on the Refuge. Non-local visitors that view wildlife on nature trails or participate in other wildlife observation activities typically spend 2 hours (1/4 a visitor day). Table I.38 shows the number of non-local visitor days by recreation activity across the Refuge. Total spending by non-local Refuge visitors was determined by multiplying the average non-local visitor daily spending by the number of non-local visitor days at the Refuge.

Spending associated with recreational visits generates significant economic activity in each sub-region. A visitor usually buys a wide range of goods and services while visiting an area. Major expenditure categories include lodging, restaurants, supplies, groceries, and recreational equipment rental. To determine the local economic impacts of visitor spending, only spending by persons living outside of the local area are included in the analysis. The rationale for excluding local visitor spending is twofold. First, money flowing into the local area from visitors living outside the local area (hereafter referred to as non-local visitors) is considered new money injected into the local economy. Second, if residents of the local area visit the Refuge more or less due to the management changes, they will correspondingly change the spending of their money elsewhere in the local area, resulting in

no net change to the local economy. These are standard assumptions made in most regional economic analyses at the local level. Refuge personnel determined the percentage of non-local Refuge visitors. Table I.38 shows the estimated percent of non-local Refuge visits and visitor days across all sub-regions.

To estimate visitor expenditures, we use average daily visitor spending profiles from the Banking on Nature report (Carver and Caudill, 2007) that were derived from the 2006 National Survey of Fishing, Hunting, and Wildlife Associated Recreation (FWS, 2008). The National Survey reports trip related spending of state residents and non-residents for wildlife-associated recreational activities. For each recreation activity, spending is reported in the categories of lodging, food and drink, transportation, and other expenses. Carver and Caudill (2007) calculated the average per-person per-visitor day expenditures by recreation activity for each FWS region. The spending profiles for nonresidents for FWS Region 5 were used. Dollar values for these expenditure profiles were updated from 2006 dollars to 2012 dollars using the Bureau of Labor Statistics CPI calculator. Average daily spending profiles for nonresident visitors to Region 5 for fishing ($60.81 per-day), upland game and other migratory bird hunting ($106.92 per-day), waterfowl ($122.53 per-day), and big game hunting ($55.64 per-day) were used to estimate non-local visitor spending for Refuge fishing and hunting related activities. The average daily nonresident spending profile for non-consumptive wildlife recreation (observing, feeding, or photographing fish and wildlife) was used for non-consumptive wildlife viewing activities ($90.71 per-day).

Table I.39 summarizes the total economic impacts, in thousands of dollars, associated with current non-local visitation by sub-region. In the Northern Sub-Region, non-local visitation accounts for about 3 jobs, $107,200 in labor income and $176,300 in value added. Non-local visitor spending in the Tri-State Border Sub-Region accounts for 1 job, $35,900 in labor income and nearly $60,000 in value added. In the Greater Amherst Sub-Region, the total economic impact of non-local visitor spending is less than one job, $1,300 in labor income and $2,400 in value added. Finally, in the Southern Connecticut Sub-Region, the total economic impact of non-visitor spending is less than one job, $1,900 in labor income and $3,100 in value added.

**Table I.39. Annual Impacts of Current Non-Local Visitor Spending**

| | Employment (# full & part time jobs) | Labor Income ($2012) | Value Added ($2012) |
|---|---|---|---|
| **Northern Sub-Region** | | | |
| Direct effects | 3 | $78,700 | $127,400 |
| Secondary effects | < 1 | $28,500 | $48,900 |
| *Total Economic Impact* | 3 | $107,200 | $176,300 |
| **Tri-State Border Sub-Region** | | | |
| Direct effects | < 1 | $24,100 | $39,400 |
| Secondary effects | < 1 | $11,800 | $20,500 |
| *Total Economic Impact* | 1 | $35,900 | $59,900 |
| **Greater Amherst Sub-Region** | | | |
| Direct effects | < 1 | $900 | $1,600 |
| Secondary effects | < 1 | $400 | $800 |
| *Total Economic Impact* | < 1 | $1,300 | $2,400 |
| **Southern Connecticut Sub-Region** | | | |
| Direct effects | < 1 | $1,300 | $2,100 |
| Secondary effects | < 1 | $600 | $1,000 |
| *Total Economic Impact* | *< 1* | *$1,900* | *$3,100* |

| | Employment (# full & part time jobs) | Labor Income ($2012) | Value Added ($2012) |
|---|---|---|---|
| **Total Effects Across Regions** | | | |
| Direct effects | 3 | $105,000 | $170,500 |
| Secondary effects | 1 | $41,300 | $71,200 |
| *Total Economic Impact* | 4 | $146,300 | $241,700 |

Under Alternative A, visitation is expected to remain the same in the Northern, White River Junction, and Tri-State Border Sub-Regions. In the Greater Amherst Sub-Region, the Fort River Universal Access Trail will be completed and visitation is expected to increase tenfold (to approximately 3,000 visits). In the Greater Hartford Sub-Region, two universal access trails are expected to be completed. It is estimated by Refuge staff that the additional access will add an additional 12,000 visits. Current visitation is also expected to increase in the Southern Connecticut Sub-Region as land acquisitions occur. The additional land purchased is expected to draw about 4,000 visitors annually to the sub-region.

In the Northern Sub-Region, it is estimated that visitation will not change under Alternative B. If Alternative B is chosen for implementation, visitation in the White River Junction Sub-Region is expected to increase by an additional 4,500 visits annually as additional land is acquired and universal trail access is established at the Ompompanoosuc River. Similarly, visitation in the Tri-State Border Sub-Region is expected to increase by 3,000 visits as additional lands are acquired and trail access improved. In the Greater Amherst Sub-Region it is estimated that annual visitation will be 4,000 as universal trail access is established at the Deadbranch, Westfield River and Mill River Conservation Focus Areas. In the Greater Hartford Sub-Region, visitation is expected to increase by an estimated 1,500 visits annually as universal trail access is added to the Farmington River Division. Finally, visitation in the Southern Connecticut Sub-Region under Alternative B is predicted to be the same as under Alternative A.

Similarly to Alternative B, if Alternative C is implemented, visitation in the Northern Sub-Region is not expected to change. Under Alternative C, visitation in the White River Junction is expected to increase similarly to Alternative B, plus an additional 1,500 visitors due to the establishment of a trail at the Sprague Brook CFA, for a total of 6,000 additional visitors to the sub-region. Visitation to both the Greater Amherst and Greater Hartford sub-regions is expected to increase similarly under Alternative C as estimated for Alternative B. Under Alternative C, visitation to the Southern Connecticut Sub-Region is expected to be the same as Alternative A.

Under Alternative D, visitation in the Northern Sub-Region is expected to decrease by 8,000 visitors as the 35 miles of snowmobile trails will be reduced to 11 miles. Total visitation is estimated to be about 14,000 visitors. Alternative D does not include the construction of developed trail, so visitation in the White River Junction and Greater Amherst Sub-Regions, is expected to increase annually by only 2,000 visits and 1,500 visits, respectively. Although trail development in the Greater Hartford Sub-Region is also not included under Alternative D, due to the region's close proximity to Hartford, visitation is expected to increase by 4,500 visitors. Finally, in the Southern Connecticut Sub-Region, a trail development is planned once acquisition of the Whalebone Cove CFA is completed. This is expected to result in an additional 1,500 visits, annually.

Similarly to non-salary expenditures, changes in visitation to the Refuge will be highly dependent on land acquisition. Refuge staff have used historic data and trends to estimate how visitation will change across alternatives, but this can vary considerably, especially in areas where the Refuge does not currently manage land and historical data is not available to provide a baseline for projections. As a result of this uncertainty, the impacts of changes in visitation across alternatives have not been quantified.

## Economic Contribution of Timber Harvesting and Agriculture

### Timber Harvesting

Forestry continues to be an important industry in the Northeastern United States, specifically in both Vermont and New Hampshire. According to the U.S. Forest Service, as of 2011, 73% (approximately 4.477 million acres) of the state of Vermont was considered timberland and as of 2009, 78.1% (approximately 4.641 million acres) of the state of New Hampshire was considered timberland (U.S. Forest Service, 2013). It is estimated that forest-based manufacturing and forest-related recreation and tourism contributes $1.5 billion annually to the Vermont economy (NEFA, 2007). These same industries contribute about $2.259 billion annually to the economy of New Hampshire (NEFA, 2011).

In addition to injecting revenue into the economies of Vermont and New Hampshire, commercial forestry and related industries are important sources of employment, providing over 12,600 jobs and 19,500 jobs in Vermont and New Hampshire, respectively (NEFA, 2007, 2011). According to NEFA, each 1,000 acres of forestland in New Hampshire directly supports an average of 1.7 forest-based manufacturing jobs and an average of 2.4 forest-related tourism and recreation jobs while in Vermont each 1,000 acres of forestland directly supports an average of 1.4 jobs in forest-based manufacturing and an average of 1.4 jobs in forest-related tourism and recreation (NEFA 2007, 2011). These are jobs supported directly and these figures do not include secondary effects.

According to Refuge staff, it is assumed that the Refuge will acquire the same amount of forestland, regardless of the chosen alternative. In order to project potential forest land that may be acquired by the Refuge, historical acquisition data were used. Based on historical land acquisitions, Table I.40 indicates, by sub-region, acreage of potential forestland that may be acquired by the Refuge during the 15-year time horizon.

**Table I.40. Acres of Potential Commercial Forest Land Likely to be Acquired**

| | Total Acres |
|---|---|
| Northern Sub-Region | 32,000 |
| Tri-State Border Sub-Region | 0 |
| Greater Amherst Sub-Region | 100 |
| Southern Connecticut Sub-Region | 300 |
| Total Acres Across Regions | 32,400 |

There are several factors that would potentially moderate the effects to the communities of the Refuge acquisitions and make directly combining the historical acquisition data with NEFA's forestry-based employment statistics to determine direct jobs lost as a result of Refuge land acquisitions unreasonable, including: 1) the employment associated with forest-based recreation and tourism is likely to remain unchanged or increase as these activities will still be taking place on Refuge managed lands and demand for these services and goods will continue or increase; 2) land acquisitions will be from willing sellers only and landowners are most likely to sell marginal lands while the NEFA employment statistics are based on statewide averages of production on all types of lands (ie highly productive to marginal); 3) acquired lands will likely be harvested by the private owner prior to sale thus all economic gains will be realized by the private owner prior to Service ownership and the harvested wood would be processed through the same channels; 4) landowners are financially compensated when they enter into a purchase agreement with the Service. Though it is unknown how those dollars would be spent, it is likely that some of the money would be injected into the local economy through the purchase of additional lands or the purchase of equipment from a local retailer; 5) some of the same forestry-based inputs will likely be purchased within the local economy as the land is managed by Refuge personnel for wildlife habitat; and 6) the amount and location of commercial forestry land to be acquired is highly uncertain, and acquisition is expected to occur gradually over the next 15 years or longer. The rate of conversion will depend on willing sellers and available budgets.

### Agriculture

Of the nearly 32,500 acres of land the Refuge expects to acquire 0.18%, or 60 acres, may be agricultural lands. The majority of the acquired agricultural lands would be in the Northern Sub-Region. Table I.41 indicates, by sub-region, where agricultural lands are likely to be acquired.

**Table I.41. Acres of Agricultural Land Likely to be Acquired**

| | Total Acres |
|---|---|
| Northern Sub-Region | 50 |
| Tri-State Border Sub-Region | 0 |
| Greater Amherst Sub-Region | 10 |
| Southern Connecticut Sub-Region | 0 |
| Total Acres Across Regions | 60 |

According to the 2007 Census of Agriculture, there are approximately 77,600 acres of farmland in Coos and Essex Counties combined (USDA, 2007). If the CCP is fully implemented, approximately 0.08% of land in production will be acquired by the Refuge. The cumulative economic impacts of this acquisition will likely be negligible across the study area.

## Conclusion

Current Refuge activities generate an economic impact across the four sub-regions where the Refuge currently manages land. Refuge non-salary expenditures directly account for 2 jobs, $57,100 in labor income and $73,900 in value added. Refuge salary spending generates an estimated 8 jobs, $283,200 in labor income and $507,400 in value added across all four sub-regions where land is currently managed by the Refuge. Current Refuge Revenue Sharing payments account for less than 1 job, $22,200 in labor income and $28,900 in value added. Current non-local visitor spending generates 4 jobs, $146,300 in labor income and $241,700 in value added. Total economic effects of Refuge operations play a much larger role in the communities near the Refuge where most of the refuge-related expenditures and public use related economic activity occurs. The economic impacts of the alternatives are highly dependent on future Refuge land acquisitions. The location and the rate of land acquisitions are unknown and thus, economic impacts of the proposed management alternatives have not been quantified.

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Appendix J

USFWS

*YCC tree restoration*

# Forest Management Guidelines

- Introduction
- Categories of Forest Management Treatments
- Anticipated Management on Lands to be Acquired in the Proposed Conservation Focus Areas
- Citations
- Glossary

## Introduction

Forest management, or silviculture, is the science of tending forests to promote particular forest characteristics. These characteristics include forest composition (e.g., species diversity), structure, and growth. At the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge), we propose to use a variety of forest management techniques to create or enhance forest habitats for priority wildlife species.

This appendix is written to provide further detail of proposed silviculture under the Comprehensive Conservation Plan (CCP) for the Conte Refuge. It includes information on the desired future condition of our forested habitats, including those areas in proposed Conservation Focus Areas (CFAs) outside the current refuge boundary where we expect to purchase land in the next 15 years. This appendix describes management techniques that may be used to meet habitat management goals and objectives.

At the end of this appendix, we provide a glossary of general forestry terms, as well as detailed descriptions of particular forest management techniques. Although there is much more to the understanding of these treatments than their definitions and nomenclature, the terminology must be understood and used carefully and precisely. The terminology in this appendix and the larger comprehensive conservation plan generally adheres to the Society of American Foresters' definitions (Helms 1998); it departs only where further clarity or precision seems warranted.

## Categories of Forest Management Treatments

There are two categories of forest management treatments:

1. Regeneration treatments.

2. Tending and intermediate cutting treatments.

***Regeneration treatments***

Regeneration methods refer to treatments of stands and sites during the period of regeneration or establishment. The act of replacing old trees, either naturally or artificially, is called regeneration. Regeneration cuttings are made with the twin purposes of removing old trees and creating environments favorable for the establishment of regenerating trees. In truly uneven-aged stands, regeneration is almost always underway in some part of the stand.

The names of the various methods of regeneration (see glossary of silvicultural techniques below) denote the patterns of cutting in time and space that determine the structure of the stands created or maintained by the process. They distinguish between reliance on regeneration from seeds or that from sprouts and may tell a little about the degree of shading of new seedlings.

***Tending or Intermediate Cutting Treatments***

In contrast to regeneration treatments, tending or intermediate cutting refers to treatment at times during the rotation other than regeneration. The rotation is the period during which a single crop or generation of trees is allowed to grow. Intermediate cuttings that are aimed primarily at controlling the growth of stands by adjusting stand density or species composition are called "thinnings." Treatments conducted to regulate species composition and improve very young stands are release operations.

The glossary at the end of this appendix describes how clearcutting is associated with even-aged stands; the shelterwood method with advanced regeneration; the selection system with uneven-aged stands.

### Desired Future Forest Conditions

The 15-year scope of the CCP is far shorter than the decades we expect it will take to create a diverse and mature forest. Our expectation is that much of the forest structure and species composition deemed important to our refuge focal species will take a minimum of 100 years to develop under the implementation of our forest management goals and objectives. Generally, our management will move stands towards a more ecologically mature forest structure characterized by:

- Trees that extend above the canopy.

- A vertically and horizontally diverse canopy.
- Increases in standing dead trees (snags) and downed woody debris—particularly larger size classes.
- Increases in the softwood component of mixed-species stands.
- The maintenance of a generally closed canopy.

These conditions favor refuge focal species, including but not limited to, wood thrush, blackburnian warblers, and black-throated blue warblers. Where appropriate, an even-aged management approach will benefit other focal species including Canada warbler, New England cottontail, and American woodcock. For more details, please see Appendix A.

Converting existing even-aged forests to a multi-cohort, mixed species forest over the long-term requires patient, active management of all forest age and structural classes (Kelty et al. 2003, Nyland 2003, Keeton 2006). Silvicultural approaches will differ by habitat types within the forest, but all efforts will respect the capability of a given site to grow certain tree species (e.g. based on soil properties, moisture regimes, elevation, and aspect). Where feasible and assuming favorable site capabilities, our management strategies will predominately favor promotion of uneven-aged, mixed species stands which we believe will best achieve our habitat goals and objectives. There are some sites, however, where techniques to promote even-aged stands would better meet our objectives. This may occur, for example, in stands where we want to encourage advanced regeneration of spruce-fir, enhance deer wintering areas, and/or to manage for American woodcock and Canada warbler.

Our draft CCP Goal 1: Wildlife and Habitat Conservation reads:

> *Promote the biological diversity, integrity, and resiliency of terrestrial and aquatic ecosystems within the Connecticut River watershed in an amount and distribution that sustains ecological function, supports healthy populations of native fish and wildlife, especially those of conservation concern, and anticipates the effects of climate and land use changes.*

Our management efforts will focus on providing sustainable high quality habitat conditions for our focal species. As noted above, in order to accomplish this, we will need to manage the various size classes and structures to ensure habitat conditions can be provided over the long-term. Not every acre on the refuge is forested, nor is every forested acre suitable for active management. Furthermore, not every forested acre on refuge land is adequately stocked as many parcels of land purchased by the refuge have been recently harvested. In these areas, very little, or no, management may be warranted to meet our habitat and focal species objectives during the 15-year lifetime of this plan.

**List of Guidelines and Best Management Practices**

At a minimum, our forest management will adhere to recommended best management practices for forest and wildlife management listed in the documents below:

- Calhoun, A.J.K. and P. deMaynadier. 2003. Forestry habitat management guidelines for vernal pool wildlife in Maine. U.S. Environmental Protection Agency, Boston, MA.
- Chase, V., L. Deming and F. Latawiec. 1997. Buffers for wetlands and surface waters: a guidebook for New Hampshire municipalities. Audubon Society of New Hampshire.
- Cullen, J.B. 2000. Best management practices for erosion control on timber harvesting operations in New Hampshire. NH Dept. of Resources and Economic Development, Division of Forests and Lands, Forest Information and Planning Bureau and University of New Hampshire Cooperative Extension.
- Bennett, Karen P. editor. 2010. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition). University of New Hampshire Cooperative Extension, Durham, New Hampshire. Accessed online April 2015 at: *http://www.goodforestry.org.*
- Reay, R.S., D.W. Blodgett, B.S. Burns, S.J. Weber, and T. Frey. 1990. Management guide for deer wintering areas in Vermont. Vermont Department of Forests, Parks, and Recreation and Department of Fish and Wildlife.
- Smith, S. and S. Whitney. 2001. Guide to New Hampshire timber harvesting laws. University of New Hampshire Cooperative Extension.

### Identifying Habitat Management Units

To facilitate the development of detailed habitat management plans (HMP), we plan to divide all refuge lands currently under fee ownership into geographic areas or habitat management units (HMUs). The HMP, which is a step-down plan to be completed upon CCP approval, will detail stand-level treatments and prescriptions (e.g., timing, distribution, method or technique, etc.) for each HMU within a given CFA. Our HMU boundaries are defined based on ecological systems and landscape features such as roads, waterways, and logistical considerations.

### Proposed Management by Forest Habitat Type

The following proposed management may be employed by the refuge during implementation of the approved CCP to achieve the desired future condition over the long-term. It includes commercial and non-commercial forest management designed to meet our focal species habitat requirements. We have broken down our descriptions of management by uneven-aged and even-aged techniques. Even-aged techniques result in stands with trees that are all generally the same age and size, while uneven-aged techniques promote forests with a greater diversity of ages and sizes of tress. These descriptions represent anticipated management. For more detailed habitat-specific management discussion please see appendix A. More detailed prescriptions by treatment unit will be developed in the HMPs and will be based on individual site conditions.

#### ***Spruce-fir Stands***

Our desired future conditions for spruce-fir stands on the refuge to benefit focal species include:

- At the stand-level, improved vertical and horizontal diversity in canopy layers while maintaining a generally closed canopy.
- Gaps should retain structural diversity in the form of standing snags.

#### ***Uneven-aged Management***

Uneven-aged management techniques will be adapted to convert the refuge's even-aged spruce-fir stands to a more diverse structure. As site conditions dictate, we plan to conduct harvest using a combination of group selection, with some single-tree selection between groups. Groups will vary in size depending on our goals and site conditions, but will generally be 1/10 acre in size and will be distributed throughout the management unit with 10 to 15 percent of the area being removed on 15- to 20-year cycles. Residual basal area (BA) goals in spruce-fir stands are approximately 80 square feet per acre with 50 percent in 6- to 10-inch diameter class; 30 percent in 11- to 14-inch diameter class; and 25 percent in a 15-inch or greater diameter class.

During each harvest entry individual trees will be identified–approximately 6 trees per acre–for retention to ecological maturity. These trees will add an important wildlife habitat component in the form of snags and eventually coarse woody debris. Our efforts will focus on retaining trees across all size classes with a particular emphasis on allowing larger diameter trees to reach ecological maturity.

#### ***Even-aged Management***

In certain areas, for instance where there is healthy, advanced spruce-fir regeneration, or in critical deer wintering areas, we may employ even-aged management techniques. This is consistent with our objective to perpetuate a multi-aged and multi-structured forest at the landscape-scale. We would conduct harvests using shelterwood or clearcuts to develop a mosaic pattern that will result in a progressive patch, block, or strip system, wherein typically 15 percent of the area is harvested in 15- to 20-year intervals.

Target rotation age is 80 to130 years and will vary by species composition (for example, balsam fir dominated stands may have shorter rotation ages) and site conditions. Assuming a 15-year harvest cycle and an approximate 100-year rotation, this equates to roughly six age classes with 33.3 percent of the area treated with even-aged techniques in a 0- to 30-year age class, 33.3 percent in a 30- to 60-year age class, and 33.3 percent in a 60- to100-year age class. If no significant natural disturbance occurs during the rotation of a treatment area, BA at the time of harvest will likely be above 140 square feet per acre, and may be in excess of 200 square feet per acre.

Snag and cavity trees will need to be retained in group openings in each harvest. We estimate retention of approximately 7 square feet per acre (e.g. approximately 6 trees per acre) to account for our snag and cavity tree requirements. Habitat improvement may need to be employed on adjacent areas to account for potential loss of this component from sudden exposure to sun, wind, storm, insect, or other natural agents.

***Mixed-species Stands***

Our desired future conditions for mixed-species stands on the refuge to benefit focal species include:

- At the stand-level, improved vertical and horizontal diversity in canopy layers while maintaining a general closed canopy.
- Gaps should favor spruce regeneration and retain structural diversity in the form of standing snags.

These stands contain a species mixture that includes softwood and hardwood tree species. Silvicultural approaches will vary within the different mixed-species forest types found on the refuge based largely on the capability of a site (e.g., based on soil properties, moisture regimes, elevation, aspect, etc.) to grow a predominance of either softwood species (e.g., spruce, fir, hemlock, pine) or hardwoods (e.g., northern hardwoods or oak). Where feasible, and assuming favorable site capability, management strategies will favor or increase the softwood component of stands.

***Uneven-aged Management***

Uneven-aged management techniques will be adapted to convert the refuge's largely even-aged mixed-species stands to a more diverse structure. As site conditions dictate, we plan to conduct harvests using a combination of group selection, with some single-tree selection between groups. Groups will vary in size depending on our goals and site capabilities, but will generally be 1/10 acre in size and will be distributed throughout the management unit with 10 to 15 percent of the area being removed on 15- to 20-year cycles. Residual BA goals in mixed species stands will vary with site conditions but will generally approach 100 feet$^2$/acre with roughly 42 percent in a 6 to 10" diameter class, 28 percent in 11 to 14" diameter class, and 30 percent in a 15" or greater diameter class.

During each harvest entry individual trees will be identified–approximately 6 trees/acre–for retention to ecological maturity. These trees will add an important habitat component in the form of snags and eventually coarse woody debris. Our efforts will focus on retaining trees across all size classes with a particular emphasis on allowing larger diameter trees to reach ecological maturity.

***Even-aged management***

Where site conditions and management goals deem appropriate (e.g., deer wintering areas and areas where advanced softwood regeneration exists) we may employ even-aged management techniques as described for softwood management (Frank and Bjorkbom 1973). These techniques will be used to perpetuate a multi-aged and multi-structured forest landscape through even-aged area regulation. We plan to conduct harvests utilizing shelterwood or clearcuts in a mosaic pattern that will result in a progressive patch, block, or strip system, wherein 15 percent of the area is harvested in 15- to 20-year intervals.

***Hardwood Stands***

Our desired future conditions for hardwood stands on the refuge to benefit focal species include:

- At the stand-level, improved vertical and horizontal diversity in canopy layers while maintaining a general closed canopy.
- Gaps should favor spruce regeneration and retain structural diversity in the form of standing snags.

***Uneven-aged Management***

Uneven-aged management techniques will be adapted to convert the refuge's even-aged hardwood stands to a more diverse structure. As site conditions dictate, we plan to conduct harvests utilizing a combination of group selection with some single tree selection between groups. Groups will vary in size depending on our goals, but will generally be approximately 1/10 acre in size (larger groups will be used to regenerate shade-intolerant species) and will be distributed throughout the entire management unit with 10 to 15 percent of the area being removed on 15- to 20-year cycles. BA goals in northern hardwoods should strive for a minimum of 70 square feet per acre with roughly 42 percent in a 6- to 10-inch diameter class, 28 percent in 11- to 14-inch diameter class, and 30 percent in a 15-inch or greater diameter class.

During each harvest entry individual trees will be identified–approximately 6 trees per acre–for retention to ecological maturity. These trees will add an important habitat component in the form of snags and eventually coarse woody debris. Our efforts will focus on retaining trees across all size classes with a particular emphasis on allowing larger diameter trees to reach ecological maturity.

***Woodcock Focus Areas***

***Even-aged Management***

In focus areas identified for woodcock or New England cottontail, we will use accepted silvicultural practices, including clearcuts and patch cuts, to:

- Create openings.
- Promote understory development.
- Sustain early successional habitat.

Some larger roosting fields may also be maintained. Cutting cycles will be approximately 8 to 10 years on a 40-year rotation. Some openings may be permanently maintained, primarily by mowing and brush clearing using mechanized equipment. We will perpetuate existing examples of the aspen-birch community in size classes appropriate for American woodcock.

## Anticipated Management on Lands to be Acquired in the Proposed Conservation Focus Areas

Over the next 15 years, as land is acquired from willing sellers in CFAs, we will evaluate lands for potential management opportunities. We will initiate a new HMP and undertake the same evaluation we conducted for current refuge lands as acquisitions, budgets, and staffing allow. Within 2 years of land acquisition, we will conduct a stand inventory and divide the ownership into management units. We will then develop management prescriptions to support the same goals and objectives for our focal species, using the same methodology we described above for current refuge lands.

## Citations

Frank, R.M., and J.C. Bjorkbom. 1973. A silvicultural guide for spruce-fir in the northeast. Page 29. General Technical Report, U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, Upper Darby, PA.

Helms, J.A. 1998. The Dictionary of Forestry. Society of American Foresters, Bethesda, MD.

Keeton, W.S. 2006. Managing for late-successional/old-growth characteristics in northern hardwood-conifer forests. Forest Ecology and Management 235:129–142.

Kelty, M.J., D.B. Kittredge Jr., T. Kyker-Snowman, and A.D. Leighton. 2003. The conversion of even-aged stands to uneven-aged structure in southern New England. Northern Journal of Applied Forestry 20:109–116.

Leak, W.B., D.S. Solomon, and P.S. DeBald. 1986. Silvicultural guide for northern hardwood types in the Northeast (revised). Page 40. Research Paper, U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, Broomall, PA.

Nyland, R.D. 2003. Even- to uneven-aged: the challenges of conversion. Forest Ecology and Management 172:291–300.

## Glossary

**Definitions of General Forest Silvicultural Terms**

*Basal area:* Basal area is the total cross-sectional area of all stems in a stand measured at breast height (4.5 feet above the ground) and expressed as a per unit of land area (typically square feet per acre).

*Canopy:* The profile of the top of the stand; the amount of cover provided by leaves in the layers of a forest stand.

*Coarse woody debris:* Any piece of dead woody material, such as dead tree trunks, limbs, large root masses, and logs on the ground or in streams. Coarse woody debris provides important habitat for many wildlife species.

*Even-aged stands versus uneven-aged stands:* Regenerative disturbances, whether naturally or artificially induced, determine when new trees appear or start active development on any given area of ground. Each aggregation of trees that starts as a result of a single disturbance is a single cohort. If the range of ages of trees within the cohort is very narrow, the new aggregation is regarded as a single age class which is also even-aged. Slightly more complicated are stands that start from so-called advanced regeneration that is already in place before the old stand is removed. An uneven-aged stand or multiple-cohort stand contains at least three age classes intermingled intimately on the same area and much more complicated developmental patterns. Mixed stands have more than one tree species, and the interaction between them makes their development even more complicated, especially if they also have more than a single age-class of trees. When identifying age classes, the profile of the top of the stand (canopy) is a good criterion because trees of the same age grow in height at roughly the same rate, provided site conditions are uniform. An even-aged stand tends to be almost smooth on top. An uneven-aged stand is distinctly irregular in height; the greater the number of age classes or cohorts, the more uneven the canopy.

*Hardwoods stand:* A forest stand dominated by deciduous trees, such as oaks, maples, beeches, etc.

*Mixed-species stand:* A forest stand with two or more predominate species.

*Silviculture:* Silviculture has been variously defined as the art of producing and tending a forest; the application of knowledge of silvics in the treatment of a forest; or the theory and practice of controlling forest establishment, composition, structure, and growth. Since silvicultural practice is applied forest ecology, it is also a major part of the biological technology that carries ecosystem management into action. Silviculture is the oldest conscious application of the science of ecology and is a field that was recognized before the term ecology was coined. Silvicultural practice encompasses all treatments applied to forest vegetation.

*Stand:* A forest stand is a contiguous group of trees, sufficiently uniform in species composition, arrangement of age-classes, site quality, and condition to be a distinguishable unit. The internal structure of a stands varies mainly with respect to the degree that different species and age classes are intermingled. The range of complexity can extend to a wide variety of combinations of age classes and species in various vertical and horizontal arrangements.

*Snags:* A standing dead tree from which the leaves and most of the branches have fallen off; can provide important wildlife habitat, particularly for nesting, denning, and/or foraging.

*Softwood stand:* A forest stand dominated by conifer species, such as spruce, fir, hemlock, and pine.

*Shade-tolerant versus shade-intolerant:* Shade-tolerant tree species are able to compete to survive under shaded conditions; sometimes also referred to just as tolerant. Conversly, shade-intolerant species are able to compete to survive under direct sunlight conditions.

**Definitions/Descriptions of Forest Silvicultural Techniques and Methods to Use in our Forest Management for Focal Species**

*Group Selection*: This technique involves the removal of small groups of trees throughout a stand, to initiate and/or maintain an uneven-aged forest. A group selection opening is considered to be less than, or equal to, twice the height of the adjacent mature trees. This method will encourage regeneration of intermediately tolerant and tolerant species, but some intolerant species can appear towards the center of the harvest areas when the groups are at the maximum size. The likelihood of the harvest areas regenerating combined with the ability to schedule continual harvest entries, results in this technique being a method of choice to convert even-aged stands to uneven-aged stands when desired.

Group selection results in moderately- closed to closed-canopy conditions. Regeneration and shrubby vegetation can be expected to develop with reasonable assurance. This technique can be used in combination with single-tree selection to ensure canopy closure requirements meet desired conditions. Priority species such as the blackburnian warbler, rusty blackbird, and Canada warbler will benefit from the application of this technique in a conifer-dominated habitat area. The predominantly closed canopy condition resulting from this technique will also benefit deer winter cover areas. The technique can be applied in all habitat types. Its application in the refuge's

spruce-fir forest most closely resembles the natural disturbance that would be expected to take place if the area were allowed to develop without manipulation.

*Single Tree Selection*: This technique involves the removal of individual trees throughout a stand. Use of this technique, on a continual harvesting cycle, is considered uneven-aged management. It can also be used during even-aged management, and when done so, is commonly referred to as an intermediate thinning. In uneven-aged management, it is used to introduce small openings in the canopy by focusing the harvest on dominant, older aged trees. In even-aged management, it is used to promote the quality and growth of the remaining trees by focusing the harvest on poor quality, low vigor trees. The technique will likely result in varying quantities of regeneration of mostly shade tolerant species.

Single tree selection results in a relatively closed canopy condition. Understory development is usually minimal. Single tree selection creates little opportunity to release or create regeneration. Canopy openings are small and any growing space created by the removal of single trees is quickly utilized by the crowns of adjacent canopy dominant trees. This technique is often used in combination with group selection to ensure regeneration is established and separate age classes are created to perpetuate the overall desired condition. In using single tree selection, with even-aged objectives in the form of a thinning, it will likely result in less opportunity for regeneration and understory development. Often times the suppressed and co-dominant trees are selected for removal resulting in very little change in canopy closure after a treatment. This technique can be applied in all habitat types.

*Pre-commercial Stand Treatments to Improve Habitat Conditions*: These treatments include entering an even- or uneven-aged stand at any stage of development with the intent of tending to habitat needs through non-commercial thinning, weeding, cleaning, liberation, sanitation, or other improvement methods. This technique can be used to control species composition and reduce an overabundance of stems per acre to a more desired stocking level. This can be applied through thinning young stands (pre-commercially) to control species composition, conducting intermediate thinnings in middle aged stands to maintain accelerated growth and remove unwanted vegetation, and prescribed fire. This technique may also be used to control stocking levels of habitat features such as snag trees, cavity trees, den trees, downed wood and other features through girdling, felling, boring, or other techniques.

This habitat improvement technique is varied in its application, but overall should be applied to alter or enhance young stands and introduce or reduce habitat features when goals and objectives are not being met. This can be applied in all habitat types and may be extended to areas that are not capable of supporting equipment for larger scale manipulation efforts.

*Shelterwood System*: This technique involves a series of harvests carried out with the intent of regenerating a stand utilizing mature trees that are removed at the end of the scheduled rotation. The overstory is removed in stages and the well-developed underlying regeneration then becomes the stand. This technique is typically used to regenerate intermediately tolerant (mid-successional) and tolerant (late successional) species, but in certain instances can be used for intolerant (early successional) species. Use of this technique is considered even-aged management, although variations more often found in the irregular shelterwood system can result in a multi-aged stand. In order for a shelterwood system to be considered, a stand should be reasonably well stocked with a moderate to high component of the species desired for regeneration.

A number of shelterwood system applications exist. The more commonly used is the open shelterwood system. Although less commonly used, the dense shelterwood, deferred shelterwood, irregular shelterwood, natural shelterwood, and nurse tree shelterwood systems are useful in accomplishing specific regenerative needs as well as other resource management objectives.

Shelterwood variations allow a variety of habitat conditions to be created while fulfilling the regenerative objectives of the technique. Irregular shelterwood systems are being used to convert even-aged or degraded stands to a more structurally diverse condition. It can be used to create a dense crown closure when connectivity of an older age forest needs to be maintained. The amount of time needed to establish regeneration and conduct the overstory removal can provide enough time for other areas to develop into an older age condition, and ensure refuge goals are being met continually. Overstory removal can be delayed through an irregular shelterwood if further development of other areas is necessary. It can also be used to create a more open crown closure when development of a shrub component in the understory is desired or residual tree are needed to meet specific habitat

requirements. Once regenerative needs have been reached and the "shelter" (seed) trees have been removed, the new stand can then be managed for structural objectives as it develops. Overstory removal can result in a regenerative condition which does offer some early successional benefits as described in the clearcut technique.

This technique can be used in all habitat types. Its application on habitats comprised of predominately shallow rooted species (e.g. red spruce/balsam fir) or wet soil conditions, does introduce a greater susceptibility of the residual trees to windthrow from wind events.

*Clearcutting*: This technique involves the removal of an entire stand of trees in one cutting to obtain natural reproduction. Two common methods of clearcutting are patch or block clearcuts, and strip clearcuts. This regeneration technique is considered to be even-aged management, although somewhat coarse multi-aged stands can be developed through progressive patch or progressive strip clearcut systems. Clearcut size affects the species mixtures that regenerate. As clearcuts increase in size, they tend to favor shade intolerant regeneration. As they become smaller they gravitate towards encouraging intermediately tolerant and tolerant species.

Clearcuts are often used to create an early successional habitat condition. Early successional habitat is when an area is in a young, shrubby, regenerating condition that covers an area large enough to be recognized and perhaps utilized by wildlife or plants associated with such an open or no-canopy condition.

This technique should be utilized when an early successional habitat condition is desired and found to be lacking or not available within the landscape. As mentioned previously in this description, clearcut size does have an impact on tree species composition, and therefore should also be utilized when current species composition is not desired or diverse enough to reach goals and objectives. This technique can be used in all habitat types, and although somewhat limiting in terms of emulating natural processes or conditions, can be used in a continual, progressive system that sustains multiple age classes through a coarse uneven-aged landscape perspective.

Appendix K

Michael Goulet

*Nulhegan Basin Division from Headquarter's Overlook*

# Silvio O. Conte National Fish and Wildlife Refuge Act

- **Silvio O. Conte National Fish and Wildlife Refuge Act**

# Silvio O. Conte National Fish and Wildlife Refuge Act

## PUBLIC LAW 102-212
## H.R. 794

### One hundred Second Congress of the United States of America

AT THE FIRST SESSION

*Begun and held at the City of Washington on Thursday, the third day of January, one thousand nine hundred and ninety-one*

**An Act**

To establish the Silvio O. Conte National Fish and Wildlife Refuge along the Connecticut River, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

**TITLE I–SILVIO O. CONTE NATIONAL FISH AND WILDLIFE REFUGE ACT**

**SECTION 101. SHORT TITLE.**

This title may be cited as the "Silvio O. Conte National Fish and Wildlife Refuge Act."

**SEC. 102. FINDINGS.**

The Congress finds and declares the following:

(1) The late Silvio Conte was a long-time champion of the preservation of natural resources, including the Connecticut River, shepherding through Congress legislation meant to restore the river and its wildlife to health.

(2) The Connecticut River and its riparian lands are unique environmental resources which provide habitat for significant anadromous, migratory, and resident fish, migratory waterfowl, and other wildlife species, including such threatened or endangered species as the shortnosed sturgeon and bald eagle.

(3) Federal, State, and local governments have spent over $600,000,000 to clean up the Connecticut river and improve the quality of its fish and wildlife habitat, resulting in the re-establishment or improvement of the populations of many species such as the Atlantic salmon, American shad, bald eagle, and peregrine falcon.

(4) The Connecticut River valley is home to over two million people, and accordingly the river and riparian lands are of great value for environmental education and natural resource based recreation.

(5) The Connecticut River valley is threatened with spoliation, removal from public access, and ecological downgrading and is a significant source of energy and means of commerce for New England.

(6) Despoiling the Connecticut River and its riparian lands will result in the permanent loss of unique social, educational, and environmental assets and will devalue the significant Federal, State, and local investments made to clean up the river.

**SEC. 103. DEFINITIONS.**

For the purposes of this Act–

(1) the term "affected States" means the Commonwealth of Massachusetts, and the States of Vermont, New Hampshire, and Connecticut;

(2) the term "refuge" means the Silvio Conte National Fish and Wildlife Refuge established under section 106 of this Act;

(3) the term "Secretary" means the Secretary of the Interior, acting through the Director of the United States Fish and Wildlife Service, and

(4) the term "selection area" means the lands and waters of the Connecticut River basin, including the main stem of the river and its tributaries from its source at Fourth Connecticut Lake to Long Island Sound.

**SEC. 104. PURPOSES.**

The purposes for which the refuge is established are–

(1) to conserve, protect, and enhance the Connecticut River valley populations of Atlantic salmon, American shad, river herring, shortnosed sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife;

(2) to conserve, protect and enhance the natural diversity and abundance of plant, fish and wildlife species and the ecosystems upon which these species depend within the refuge;

(3) to protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.);

(4) to restore and maintain the chemical, physical, and biological integrity of wetlands and other waters within the refuge;

(5) to fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands; and

(6) to provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access to the extent compatible with the other purposes stated in this section.

**SEC. 105. SELECTION OF LANDS.**

Within three years after the date of the enactment of this Act, the Secretary shall–

(1) consult with appropriate State and local officials, including those representing State government natural heritage inventory agencies, the Long Island Sound management Conference as established under the National Estuary Program, private conservation organizations, and other interested parties in designating the refuge boundaries;

(2) define and designate the refuge boundaries, including all subunits, within the selection area that would fulfill the purposes set forth in section 104 of this Act, and

(3) prepare a detailed map depicting the refuge boundaries designated under paragraph (2), which the Secretary shall keep on file and available for public inspection at offices of the United States Fish and Wildlife Service, and publish notice in the Federal Register of such availability.

**SEC. 106. ACQUISITION AND ESTABLISHMENT OF REFUGE.**

(a) ACQUISITION.–To the extent authorized under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f-a-5), the Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460k-4-11), the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), the Migratory Bird Conservation Act (16 U.S.C. 715-715s), the Emergency Wetlands Resources Act of 1986, as amended (16 U.S.C. 3901 et seq.), the North American Wetlands Conservation Act (16 U.S.C. 4401-4413), and other existing laws, the Secretary may acquire for inclusion in the refuge by purchase or donation such lands and waters or interests therein (including permanent conservation easements) within the boundaries defined and designated under section 105 of this Act. All lands, waters, and interests therein so acquired shall be part of the refuge.

(b) ESTABLISHMENT.–When sufficient property within the boundaries defined and designated under section 105 of this Act have been acquired to constitute an area that can be effectively managed as a refuge, the Secretary shall establish the refuge, to be named the "Silvio Conte National Fish and Wildlife Refuge," by publishing a notice to that effect in the Federal Register and publications of local circulation.

(c) BOUNDARY REVISIONS.–The Secretary may make such minor revisions in the boundaries of the refuge defined and designated under section 105 of this Act as may be appropriate to carry out the purposes of this Act or to facilitate the acquisition of property within the refuge.

(d) INTERIM REPORT TO CONGRESS.–Within one year of the date of enactment of this Act, the Secretary shall submit to the Committee on Environment and Public Works in the United States Senate and the Committee on Merchant Marine and Fisheries in the United States House of Representatives a report describing those lands and waters that the Secretary proposes to acquire under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a-5)), the Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460k-4-11), the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), the Migratory Bird Conservation Act (16 U.S.C. 715-715s), the Emergency Wetlands Resources Act of 1986, as amended (16 U.S.C. 3901 et seq.), the North American Wetlands Conservation Act (16 U.S.C. 4401-4413), and other existing laws for inclusion in the refuge at a subsequent time. The Secretary also shall include in the report an estimate of the total number of acres of lands or waters or interests therein that may be acquired for inclusion within the refuge boundaries under the authority of this Act and other existing laws and the approximate cost of such acquisition.

**SEC. 107. ADMINISTRATION.**

(a) IN GENERAL.–The Secretary shall administer all lands, waters, and interests therein acquired under section 106 pursuant to–

(1) the provisions of the national Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) and the Refuge Recreation Act (16 U.S.C. 460k-460k-4); and

(2) the purposes for which the refuge is established, as set forth in section 104 of this Act.

(b) OUTREACH AND EDUCATION.–The Secretary shall work with, provide technical assistance to, provide community outreach and education programs for or with, or enter into cooperative agreements with private landowners, State and local governments or agencies, and conservation organizations to further the purposes for which the refuge is established, as set forth in section 104 of this Act.

(c) USE OF OTHER AUTHORITY.–The Secretary may utilize such other statutory authority as may be available to the Secretary for the conservation and development of wildlife and natural resources, the development of outdoor recreation opportunities, and interpretive education, as the Secretary considers appropriate to carry out the purposes of the refuge as set forth in section 104 of this Act.

**SEC. 108. SILVIO CONTE NATIONAL FISH AND WILDLIFE REFUGE ADVISORY COMMITTEE.**

(a) ESTABLISHMENT AND FUNCTIONS.–Within three months after the date of enactment of this Act, the Secretary shall establish a committee to be known as the "Silvio Conte National Fish and Wildlife Refuge Advisory Committee" (hereinafter referred to as the "Advisory Committee") which shall assist the Secretary on community outreach and education programs that further the purposes of the refuge.

(b) MEMBERSHIP; TERMS.–The Advisory Committee shall be composed of fifteen members, each appointed by the Secretary within three months of the date of enactment of this Act for a term not to exceed three years, as follows:

(1) four members, including one from each of the affected States, to be recommended by the Governor of each State as representing the cities or towns bordering the Connecticut River and its tributaries;

(2) four members, including one from each of the affected States, to be recommended by the Governor of each State as representing State agencies with responsibility for conservation or water quality programs;

(3) four members, including one form each of the affected States, to be appointed from recommendations made by the Governor of that affected State, who shall represent nonprofit conservation organizations or citizen groups with direct interest in the purposes of the refuge;

(4) one member of the Long Island Sound Management Conference; and

(5) two members to be designated by the Secretary, including one who represents the energy and commerce interests associated with the Connecticut River.

(c) CHAIRMAN.–The Advisory Committee shall elect one member of the Advisory Committee to be its chairman.

(d) VACANCIES.–Any vacancy in the Advisory Committee shall be filled in the same manner in which the original appointment was made.

(e) COMPENSATION.–A member of the Advisory Committee shall not receive any compensation for service on the committee.

(f) MAJORITY VOTE.–The Advisory Committee shall act by affirmative vote of a majority of the members thereof.

**SEC. 109. INTERPRETATION AND EDUCATION CENTER**

(a) IN GENERAL.–The Secretary is authorized to construct, administer, and maintain at appropriate sites within the refuge, or pursuant to subsection (b) cooperate in the construction, operation and maintenance at an appropriate site, not more than four aquatic resources and wildlife interpretation and education centers, known as Silvio Conte National Fish and Wildlife Refuge Education Centers, along with administrative facilities, to provide opportunities for the study, understanding, and enjoyment of aquatic resources and wildlife in its natural habitats.

(b) COOPERATIVE AGREEMENTS.–The Secretary is authorized:

(1) to enter agreements to share the construction and operation of and the land acquisition for the center, including the costs thereof, with State and local governments and other public and private entities;

(2) to utilize appropriated or donated funds for construction, operation and maintenance expenses *Provided*, That Federal interests arising from such expenditures are protected by a long-term lease, agreement, or transfer of property interest; and

(3) to interpret the Connecticut River's aquatic and wildlife resources in the context of the region's cultural, geological, and ecological history.

**SEC. 110. AUTHORIZATION OF APPROPRIATIONS.**

There is authorized to be appropriated to the Secretary such sums as may be necessary to carry out the purposes of this Act.

**TITLE II–MISCELLANEOUS PROVISIONS**

**SEC. 201. ESTABLISHMENT AND TERMS OF SILVIO O. CONTE MEMORIAL SCHOLARSHIP FUND.**

(a) IN GENERAL.–In recognition of Silvio O. Conte's longstanding contribution and devotion to the conservation of our Nation's natural resources, and his life-long commitment to education, the Director of the United States Fish and Wildlife Service, hereinafter referred to as the Director, is authorized to enter into an agreement with the National Fish and Wildlife Foundation, hereinafter referred to as the Foundation, and the University of Massachusetts/Amherst, hereinafter referred to as the University, to establish the Silvio O. Conte Memorial Scholarship Fund. The purpose of the agreement is to encourage students to enter the fields of fisheries and wildlife ecology and conservation, natural resources policy and administration, or ecology by establishing a scholarship fund at the University.

(b) TERMS OF AGREEMENT.–Notwithstanding the provisions of the Federal Grant and cooperative Agreements Act of 1977 (31 U.S.C. 6301-6308), the agreement authorized under subsection (a) of this section shall direct that the University shall:

(1) establish the Silvio O. Conte Memorial Scholarship Fund for the purpose of awarding scholarships for a period not exceeding three years to eligible candidates in advanced degree programs in the fields of fisheries and wildlife ecology and conservation, natural resources policy and administration, or ecology;

(2) invest funds provided by the Director, the Foundation and any other contributors in interest-bearing accounts;

(3) award scholarships annually utilizing the interest generated from such investment accounts minus the amount equal to inflation;

(4) match the scholarship awards with in-kind contributions of equal value, such as waivers of tuition or fees or the provision of other financial aid;

(5) establish eligibility criteria based upon financial needs, academic achievement, and potential contribution of the profession;

(6) announce the availability of the scholarship in a manner which ensures that it is widely distributed and that minority and socially-disadvantaged candidates are made aware of the opportunity;

(7) upon request by the Director, make available the investment for his inspection; and

(8) prepare and provide to the Director annually a report regarding the expenditures from the investment accounts which shall include the number of scholarships awarded, the amount of each scholarship, and the share of each scholarship provided by the University.

(c) AUTHORIZATION.—The Director is authorized to make a one-time contribution of up to $50,000 to the University to establish the Silvio O. Conte Memorial Scholarship Fund.

(d) TERMINATION OF AGREEMENT.—At such time as the parties agree to terminate the agreement authorized under subsection (a) of this section, the principle and interest in the account shall be deposited in the Migratory Bird Conservation Fund.

**SEC. 202. WILDLIFE INTERPRETATION AND EDUCATION CENTER.**

Title II of Public Law 100-610 is amended by adding at the end the following new section:

**"SEC. 208. WILDLIFE INTERPRETATION AND EDUCATION CENTER.**

"(a) The Secretary is authorized to construct, administer, and maintain at an appropriate site, a wildlife interpretation and education or visitor center.

"(b) The Secretary is authorized—

"(1) to enter agreements to share the construction and operation of and the land acquisition for the center, including the costs thereof, with State and local governments and other public and private entities;

"(2) to utilize appropriated or donated funds for construction, operation and maintenance expenses, provided that Federal interests arising from such expenditures are protected by a long-term lease, agreement or transfer of property interest; and

"(3) to interpret the Pettaquamscutt Cove region's aquatic and wildlife resources in the context of the region's cultural, geological, and ecological history."

**TITLE III—CULEBRA NATIONAL WILDLIFE REFUGE**

**SEC. 301. HEADQUARTERS FACILITY FOR CULEBRA NATIONAL WILDLIFE REFUGE.**

The headquarters facility and residence for the Culebra National Wildlife Refuge may be constructed on lands leased from the Commonwealth of Puerto Rico on a long-term basis.

**SEC. 302. COST-SHARING FOR STATE COASTAL WETLANDS GRANTS.**

(a) FEDERAL SHARE.—Section 305(d)(1) is amended by striking "has established a trust fund, from which the principal is not spent, for the purpose of acquiring coastal wetlands, other natural area or open spaces" and inserting in lieu thereof, "has established and is using one of the following for the purpose of acquiring coastal wetlands, other natural areas or open spaces:

"(A) a trust fund from which the principal is not spent; or "(B) a fund derived from a dedicated recurring source of monies including, but not limited to, real estate transfer fees or taxes, cigarette taxes, tax check-offs, or motor vehicle license plate fees."

(b) EFFECTIVE DATE.—This section shall apply to grants awarded in fiscal year 1992 and each fiscal year thereafter.

Appendix L

USFWS

*Controlled burning on the Conte Refuge*

# Fire Management Guidance

- Introduction
- Fire Management Planning
- Fire Management Program at Conte Refuge
- Literature Cited

## Introduction

The U.S. Fish and Wildlife Service's (Service) Northeast Regional Fire Program (Fire Program) helps support the mission of the National Wildlife Refuge System (Refuge System) by creating and managing important wildlife habitat using prescribed fire, and protecting human safety by reducing the risk of wildfire through fire suppression. This appendix outlines guidance for fire management, explains the fire management planning process, and describes the current fire management program at Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge).

There were no wildfires (unplanned, human-caused ignitions) on refuge ownership since the Service acquired lands. The only recent fire history for the Conte Refuge was adjacent to the Nulhegan Basin Division in Essex County, Vermont. From 1991 to 2000, there were 24 wildfires were suppressed within the county. Only four of these were lightning-caused; the majority of the other human-caused wildfires were from escaped debris burns.

At the Nulhegan Basin Division, five mechanical treatments (thinning and brush clearing) to modify fuels were completed between 2002 and 2008. These treatments were to provide better access to refuge resources and assets by opening or maintaining roads and trails and to provide "defensible space" around several of the cabins by reducing and removing flammable vegetation. Overall, hazardous fuels were removed on 200 acres.

### The Role of Fire

In pre-settlement forests of northern New England–unlike other forest types across the country–wildfire was not a common ecological disturbance (Day 1953, Lorimer 1977, Cogbill et al. 2002). It has been estimated that low intensity surface fire crept through northern hardwood forest types every 600 years, with more severe burning fire having a very long return interval of 3,000 years (Bonnicksen 2000). Conifer types (the great spruce-fir forests in New England had a 200- to 400-year return interval or longer (Lorimer 1977, Pyne 1997, Bonnicksen 2000). Even so, small-scale, more frequent, disturbances along with fire did occur thus creating a mosaic of forest conditions (Lorimer 1977, Bouchard et al. 2007).

Historically, natural fire and ignitions by Native American people played an important disturbance role in many ecosystems by:

- Removing fuel accumulations.
- Decreasing the impacts of insects and diseases.
- Stimulating regeneration of vegetation.
- Cycling nutrients.
- Providing a diversity of habitats for plants and wildlife.

With large-scale commercial logging (1850 to early 1900s) and the advent of the steam locomotive that made it easier to ship wood products from New England, several catastrophic wildfires occurred from excessive and unnatural fuel loading (logging slash) laying on the ground (Pyne 1997). There were no organized suppression organizations to fight these early fires until the turn of the 20th century when states recognized the need for suppression resources, detection services, and fire patrols during peak burning conditions. Other disturbances, such as spruce budworm outbreaks, also contributed.

With the end of the logging era in the early 20th century, wildfire occurrence in the Northeast showed a marked decline. Wildfire occurrence continues to remain low because of greater access (i.e., greater number of roads) allowing for quicker response, modernized suppression equipment, regulations prohibiting the illegal kindling of wildland fire (i.e., illegal wildfires), and climatic conditions not conducive to large fire growth. Wildfire return intervals have returned to a more natural or historic state becoming a concern only under severe drought conditions and then usually short-lived.

Wildfire, in the form of prescribed fire or commonly called "controlled burning," does have a role within New England as an ecological disturbance factor. When used properly, and in conjunction with other management tools (mechanical manipulation of vegetation), it can:

- Reduce hazardous fuels build-up in both wildland-urban interface[1] and other areas.
- Improve wildlife habitats by reducing the density of vegetation, and/or changing plant species composition.
- Sustain and increase biodiversity.
- Improve woodlands and shrublands by influencing plant density.
- Reduce the susceptibility of plants to insect and disease outbreaks.
- Assist in the control of invasive and noxious species.

Wildland Fire and Management Policy and Guidance

In 2001, the Secretaries of the Interior and Agriculture approved an update to the 1995 Federal Fire Policy. The 2001 Federal Wildland Fire Management Policy directs Federal agencies to achieve a balance between using fire suppression to protect life, property, and resources, and using wildland fire to regulate fuels and maintain healthy ecosystems (*http://www.nwcg.gov/branches/ppm/fpc/archives/fire_policy/history/index.htm;* accessed April 2013). It also directs agencies to establish a unified and cohesive fire management policy for all Federal agencies and to work together to implement this policy. Agencies will provide a management response to all wildfires that is commensurate with the values at risk, human safety, and the costs for suppression. This policy provides nine guiding principles that are fundamental to the success of the fire management program. These guiding principles are as follows:

1. Firefighter and public safety is the first priority in every fire management activity.
2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into all land management planning processes.
3. Fire management plans, programs, and activities support land and resource management plans and their implementation.
4. Sound risk management is a foundation for all fire management activities.
5. Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.
6. Fire management plans and activities are based upon the best available science.
7. Fire management plans and activities incorporate public health and environmental quality considerations.
8. Federal, State, Tribal, local, interagency, and international coordination and cooperation are essential.
9. Standardization of policies and procedures among federal agencies is an ongoing objective.

The following provides further direction for fire management decisions:

- Every wildfire requires a response and decision on how to respond to it.
- The Service's initial reaction to human caused fires will be to suppress the fire while providing for firefighter and public safety, limiting damage and loss, and minimizing costs of the fire.

[1] The wildland-urban interface is the line, area, or zone where human development and structures meet with undeveloped wildland or vegetative fuels.

- The interagency nature of fire management work requires the involvement and participation of cooperators, including both State and local agencies, in planning for, and responding to, wildfire.

The Service's Fire Management Handbook provides standards for operational fire management activities, procedures, and practices based upon interagency, Departmental, and Service policies (*http://www.fws.gov/fire/handbook/index.shtml;* accessed April 2013). The Fire Management Handbook is updated annually to coincide with the Interagency Standards for Fire and Fire Aviation Operations Handbook and is incorporated by reference into the Service Manual (621 FW 1).

## Fire Management Planning

In 2004, refuge staff developed Fire Management Plans (FMP) for the Nulhegan Basin and Pondicherry Divisions. A FMP defines the fire management direction based on the objectives outlined in the Comprehensive Conservation Plan (CCP) and Habitat Management Plans (HMP) when developed. A FMP follows the most recent Interagency Fire Management Plan Template (April 2009) and applies the most recent Service-specific guidance on use of that interagency template. Once the CCP and subsequent HMP are completed, we will update the FMP to cover all refuge units and divisions. Once approved, the FMP will provide a detailed description of how the refuge will:

- Respond to wildland fires.
- Manage fuels to reduce the risk of wildland fires.
- Use prescribed burning to meet management objectives, if applicable.

In order for a refuge to use wildland fire, prescribed burning, and other hazardous fuel reduction techniques, these methods must be specified within the approved refuge's FMP, based on step-down direction from the CCP and any HMPs. If none of these methods are described in the FMP, the refuge's only allowable response to wildland fire is an aggressive suppression response, with full control of a wildfire as quickly, safely, and cost effectively as possible. For all wildfires, only the safest tactical responses are considered.

The shelf-life of the FMP matches the 15-year life of a CCP. However, the refuge manager and zone fire management officer must annually review the FMP, discuss and update FMP sections as needed, and complete an amendment containing any updates. Any significant changes, such as change in policy or refuge management direction, or additional land acquired, may warrant a complete rewriting of the plan.

## Fire Management Program at Conte Refuge

### Management Direction

The current management direction only allows for wildfire suppression across all divisions of Conte Refuge. Guidance in the Nulhegan FMP allows for fuel reduction projects by mechanical methods only. This would include roadside thinning, clearing, or brush removal, reducing dead and dead surface fuels by chipping or biomass removal, and vegetation projects that that creates defensible space around structures. Once passed CCP/EIS direction, along with any future HMP direction will be incorporated into the draft FMP, submitted for public review and NEPA compliance.

### Fire Management Goals

The goals and strategies of the Refuge System's Wildland Fire Management Program Strategic Plan are consistent with Department of Interior's National Fire Plan direction, the President's Healthy Forest Initiative, the 10-year Comprehensive Strategy and Implementation Plan, National Wildfire Coordinating Group Guidelines, initiatives of the Wildland Fire Leadership Council, Cohesive Strategy and Interagency Standards for Fire and Aviation operations.

In addition to wildfire suppression, proposed management goals for the refuge are to use prescribed fire to meet the habitat goals and objectives identified in this CCP and to protect refuge resources through treatment

of hazard fuel accumulations by mechanical and prescribed fire as treatment methods. After the CCP is complete, refuge staff will develop habitat management plans for each refuge division and unit that will include more details on the specific treatment areas and techniques.

### Fire Management Objectives

The purpose of the fire management program will be to use prescribed fire, chemical, and manual and mechanical treatment to:

- Ensure public and firefighter safety remain the highest priority while protecting property and natural resource values from wildland (wildfire and prescribed) fire.
- Reduce harmful wildfire impacts to all resource management activities. This can be accomplished in part by reducing the excessive accumulations of hazardous fuel loads in woodland habitats with high resource values (e.g., protecting mature, closed-canopy late successional habitat, that provides cover, den and rearing qualities needed for Canada lynx recovery efforts) or reduce activity generated slash from proposed logging treatments.
- Provide for the enhancement and protection of critical habitat for State and federally endangered or threatened species, as well as other species of special concern.
- Provide, maintain, enhance, and protect nesting, brooding, feeding, and resting habitat that meet the requirements of migratory birds and resident wildlife.
- Facilitate the control of invasive and exotic species.
- Increase habitat diversity in refuge upland habitats.
- Demonstrate to, and educate the public about the role and benefits of wildland fire protection and prescribed fire use in natural resource management.
- Maintain current ecosystem diversity within the landscape context
- Comply with State Air Quality Implementation Plans to protect public respiratory health and the environment.

### Fire Management Strategies

The refuge will use a combination of fire management strategies, tactics, and tools that consider public and firefighter safety, as well as resource values at risk. Based on the CCP and habitat management direction, the FMP will provide a more detailed description of the wildfire suppression, prescribed fire, chemical, manual, and mechanical treatment methods Conte Refuge may use. The FMP will also explain the timing and monitoring of the refuge's fire management strategies. As needed, the refuge will develop prescribed fire burn plans for specific sites, following the latest version of Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide.

Some fire management strategies, such as prescribed burning, may impact air quality. Wildland fire temporarily reduces air quality by diminishing visibility and releasing particulates and pollutants through combustion. By regulation and policy, wildfire events are an exemption (an uncontrolled, unwanted event not planned for). Conte Refige will meet national ambient air quality standards set forth in the Clean Air Act and where applicable, adhering to various State Air Quality Implementation Plans during all prescribed fire activities.

### Fire Management Organization, Contracts, and Cooperation

The Service's Northeast Regional Fire Program is divided into four fire management zones which provide technical fire management oversight to refuges. Conte Refige is within the New England fire management zone, which includes all the national wildlife refuges and fish hatcheries within the New England states. There is no dedicated fire staffing currently assigned to Conte Refige. The fire management zone is served by the zone fire management officer (Zone FMO) based at Rhode Island NWR Complex. All fire management

activities are conducted in a coordinated and collaborative manner within the New England zone in order to share fire qualified individuals and equipment. This also includes our Federal, State, and local fire departments and private partners, such as The Nature Conservancy.

Upon approval of this CCP, any step-down direction, such as a habitat management plan, or decisions based on emergency protection, where dangerous fuel conditions pose undo risks, a new FMP may be necessary and developed for Conte Refige, inclusive of all its divisions.

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Appendix M

Mike Ostrowski

*Puritan tiger beetle*

# Conservation Plans and Initiatives Guiding the Development of the CCP

- Introduction
- Migratory Birds
- Fish and Aquatic Resources
- Mammals
- Invertebrates
- Rare Plants, Wetlands, and Other Natural Communities
- State Comprehensive Wildlife Conservation Strategies/ Wildlife Action Plans
- Invasive Species
- Watershed Plans
- Recreation Plans
- Statewide Comprehensive Outdoor Recreation Plans (SCORP)
- Other Regional Information Sources

## Introduction

We considered the conservation goals and objectives of existing Federal trust resource plans and regional ecosystem plans that relate to CT River watershed to help determine how the Silvio O Conte National Fish and Wildlife can best contribute to species conservation and ecosystem function, while also achieving its legislative purposes. To the extent practicable, we will be consistent with respective states' fish and wildlife conservation plans, and the conservation programs of Tribal, public, and conservation partners within the watershed. Regional and state outdoor recreation plans were also considered. The following plans were reviewed and considered during development of the Silvio O. Conte Refuge Draft CCP/EIS goals and objectives.

## Migratory Birds

**North American Bird Conservation Initiative (NABCI)**

North American Bird Conservation Initiative (NABCI) is a continental partnership initiative to integrate and effectively implement existing and emerging, international, national, and regional bird conservation plans. NABCI originated in 1998 from the Commission for Environmental Cooperation (CEC), an international organization created by Canada, Mexico and the United States under the North American Agreement on Environmental Cooperation (NAAEC). The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and promote effective enforcement of environmental law. The NAAEC complements the environmental provisions of the North American Free Trade Agreement (NAFTA) (*http://www.nabci-us.org/main2.html*; accessed May 2013).

In 1999, a NABCI Committee was formed in the U.S, representing a coalition of government agencies, private organizations, and bird initiatives working to advance integrated bird conservation based on sound science and cost-effective management that will benefit "all birds in all habitats." The NABCI Committee is a forum of government agencies, private organizations, and bird initiatives helping partners across the continent meet their common bird conservation objectives. The NABCI Committee's strategy is to foster coordination and collaboration on key issues of concern, including coordinated bird monitoring, conservation design, private land conservation, international conservation, and institutional support in state and Federal agencies for integrated bird conservation.

NABCI strives to integrate the individual bird conservation plans discussed below within regionally specific areas–Bird Conservation Regions (BCRs). Integration usually involves creating an integrated BCR plan based upon the separate plans noted below; these plans outline conservation (habitat and species) priorities, implementation, and evaluation. BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. There are 37 BCRs across North America. Priority species are designated in a similar fashion in each BCR, based on their level of concern in continental conservation plans, regional "step-down plans," the importance of the BCR to their continental or global distribution (i.e., the BCR responsibility), and the perceived level of threat to the species and/or their habitat within the BCR.

The primary purposes of BCRs, as proposed by the mapping team in 1998 and approved in concept by the US Committee in 1999, are to:

- Facilitate communication among the bird conservation initiatives.
- Systematically and scientifically apportion the US into conservation units.
- Facilitate a regional approach to bird conservation.
- Promote new, expanded, or restructured partnerships.
- Identify overlapping or conflicting conservation priorities.

The Connecticut River watershed and the Conte Refuge are part of two BCRs: Atlantic Northern Forest (BCR 14) and the New England Mid-Atlantic Coast (BCR 30).

***Blueprint for Design and Delivery of Bird Conservation in the Atlantic Northern Forest (BCR 14).***
BCR 14 generally covers the northern half of the watershed, largely Vermont and New Hampshire, and encompasses almost all of Maine. It contains 10 Globally Important Bird Areas (IBAs), three of which occur within the Connecticut River watershed. The draft BCR implementation plan, or "blueprint" for "all bird conservation" identifies several priority habitats found within the bounds of the Refuge including: freshwater lakes, palustrine emergent marshes, forested wetlands, deciduous forests, coniferous forests, mixed forests, shrub/scrub early successional forests, and grasslands. Several of the highest priority birds are found in the watershed: American woodcock, bay-breasted warbler, Bicknell's thrush, American black duck, Canada warbler, and wood thrush.

We used this plan to help identify priority bird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to birds. The draft plan for BCR 14 is posted on the Atlantic Coast Joint Venture Web site at: *http://www.acjv.org/documents/bcr14_blueprint.pdf* (accessed May 2013).

***New England/Mid-Atlantic Coast (BCR 30)***
This largely coastal BCR extends from lower Maine to the tidewater areas of Virginia along the Atlantic Coast, and includes much of the lower Connecticut River watershed in Massachusetts and Connecticut. There are 35 IBAs within this BCR, although none exist within the largely urbanized lower Connecticut River watershed. Habitat loss and fragmentation is the principal threat to all habitats in this BCR. Coastal marshes and mature forests are the highest priority habitats in this BCR. Another concern is declining habitat quality, particularly in salt marshes, early succession, forested habitats, and wetlands. Invasive plants are an existing and growing threat to habitat integrity. Predation is a concern throughout the BCR for beach-dependent species and coastal marsh-dependent birds such as breeding waterfowl, shorebirds, terns, and rails. Highest priority birds in this BCR include the American black duck, American oystercatcher, red knot, ruddy turnstone, sanderling, American woodcock, semipalmated sandpiper, dunlin, black rail, blue-winged warbler, piping plover, prairie warbler, wood thrush, saltmarsh sparrow, Nelson's sparrow, and seaside sparrow.

We used this plan to help identify priority bird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to birds. The BCR 30 final plan is available at: *http://www.acjv.org/BCR_30/BCR30_June_23_2008_final.pdf* (accessed May 2013).

**North American Waterbird Conservation Initiative and Plan (2006)**
The Waterbird Conservation for the Americas initiative (Waterbirds initiative) is an independent, international, broad-based, and voluntary partnership created to link the work of individuals and institutions having interest and responsibility for conservation of waterbirds and their habitats in the Americas. Waterbirds are species that are dependent on aquatic habitats to complete portions of their life cycles. Waterbirds covered by this initiative include 209 species known commonly as seabirds, coastal waterbirds, wading birds, and marshbirds.

We used this plan to help identify priority waterbird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to waterbirds. For more information on the intiative, visit: *http://www.waterbirdconservation.org/* (accessed May 2013).

**Birds of Conservation Concern (BCC) – U.S. Fish and Wildlife Service (2008)**
Birds of Conservation Concern (BCC) 2008 identifies the bird species, beyond those already designated as federally threatened or endangered, that are the highest conservation priorities for the U.S. Fish and Wildlife Service (USFWS 2008). The report covers three different geographic scales: the entire United States, including island "territories" in the Pacific and Caribbean; U.S. Fish and Wildlife Service Regions; and Bird Conservation Regions (BCRs), as defined by the North American Bird Conservation Initiative (NABCI). It is primarily derived from three major bird conservation plans:

1. The Partners in Flight (PIF) North American Landbird Conservation Plan.

2. The U.S. Shorebird Conservation Plan.

3. The North American Waterbird Conservation Plan.

All three of these bird conservation plans identify species of concern based on several factors, including population trends, threats, distribution, abundance, and relative density. We used this report to help identify

bird species of conservation concern for Conte Refuge. The report is available online at: *http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf* (accessed May 2013).

**North American Waterfowl Management Plan (NAWMP)**
During the 1980s, recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help in the recovery of a seriously declining wildlife resource, the U.S. and Canadian governments, and later Mexico, developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. The North American Waterfowl Management Plan was originally written in 1986, and revised in 1998 and 2004, envisioned a 15-year effort to achieve landscape conditions that could sustain continental waterfowl populations. This plan outlined a strategy among the signatory countries to protect North America's remaining wetlands and to restore waterfowl populations through habitat protection, restoration, and enhancement. The 2004 Plan establishes a new 15-year planning horizon for waterfowl conservation in North America by assessing the needs, priorities, and strategies required to guide waterfowl conservation in the 21st Century. The 2004 Plan can be accessed online at: *http://www.acjv.org/documents/nawmp_2004.pdf* (accessed May 2013).

Implementation of this plan is accomplished at the regional level within 15 regional habitat "Joint Venture" areas. A "Joint Venture" is a self-directed partnership of agencies, organizations, corporations, tribes, or individuals that has formally accepted the responsibility of implementing national or international bird conservation plans within a specific geographic area or for a specific taxonomic group, and has received general acceptance in the bird conservation community for such responsibility. In support of bird conservation goals, joint venture partners conduct biological planning, habitat protection and restoration, monitoring and evaluation, and communications and outreach.

Conte Refuge is located within the Atlantic Coast Joint Venture (ACJV) area, which covers all the Atlantic Flyway states from Maine to Florida and Puerto Rico. The goal for the ACJV is to "protect and manage priority wetland habitats for migration, wintering, and production of waterfowl, with special consideration to black ducks, and to benefit other wildlife in the joint venture area."

The ACJV Implementation Plan was revised in 2005. It steps down continental and regional waterfowl population and habitat goals from the NAWMP 2004 Plan Update to the ACJV area. It presents habitat conservation goals and population indices for the ACJV consistent with the 2004 Update, provides current status assessments for waterfowl and their habitats in the joint venture, and updates focus area narratives and maps for each state. The Connecticut River watershed contains three focus areas: The Lower Connecticut River of Connecticut, the Connecticut River shared by New Hampshire and Vermont, and the Lake Memphramagog focus area of northeastern Vermont. This 2005 Implementation Plan also provides a baseline of information needed to move forward with a thorough approach for setting future habitat goals.

We used this plan to help identify priority waterfowl species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to waterfowl. The 2005 Implementation Plan can be accessed at: *http://www.acjv.org/* (accessed May 2013).

**Partners in Flight Conservation Plans**
In 1990, Partners in Flight (PIF) was conceived as a voluntary, international coalition of government agencies, conservation organizations, academic institutions, private industry, and other citizens dedicated to reversing the trends of declining bird populations and to "keeping common birds common." The foundation of PIF's long-term strategy for bird conservation is a series of scientifically based bird conservation plans, using physiographic provinces as planning units. The PIF Program has developed draft plans for the three physiographic areas that intersect the Connecticut River Watershed (see below). We use components of these plans to guide bird management on the Conte Refuge. The plans rank species conservation importance within a regional area based on a variety of factors including global threats, high concern for regional or local populations, or responsibility for conserving large or important populations. The PIF draft plans also rank habitats based on overall conservation priority.

We used this plan to help identify priority migratory bird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to migratory birds. For more information on the PIF plans, visit: *http://www.partnersinflight.org/* (accessed May 2013).

***Southern New England Bird Conservation Plan (Physiographic Area #09)***
This physiographic area extends from Long Island Sound through the Connecticut River valley to the northern border of Massachusetts. According to this plan, the greatest conservation challenge facing land managers today is the ever-increasing number of people residing in the area. To meet this challenge, the plan identifies priority land bird species and habitat types, and recommends specific objectives aimed at protecting those species and their habitats. Examples of high priority species within the Connecticut River watershed include the piping plover, upland sandpiper, American woodcock, salt marsh sharp-tailed sparrow, seaside sparrow, American black duck, wood thrush, cerulean warbler, prairie warbler, blue-winged warbler, worm-eating warbler, golden-winged warbler, and Louisiana waterthrush. All eight priority habitat types identified in the plan are represented within the bounds of the Connecticut River watershed.

We used this plan to help identify priority migratory bird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to migratory birds. The New England Bird Conservation Plan can be accessed at: *http://www.partnersinflight.org/bcps/plan/pl_09_10.pdf* (accessed May 2013).

***Northern New England Bird Conservation Plan (Physiographic Area #27)***
This physiographic area lies across the middle portion of the Refuge from central New Hampshire and Vermont to the slopes of the Berkshire Mountains in western Massachusetts. Forested landscapes comprise most of the region; however, the human population has increased significantly in the recent past. Single-family housing in both rural and suburban settings is becoming an important issue for conservation. Agriculture and forest management are key to habitat availability. Priority species found within the Refuge include Canada warbler, chestnut-sided warbler, and American woodcock. Five of the seven priority habitats lie within the refuge. These include freshwater lakes and wetlands, mature conifer forest, northern hardwood and mixed forests, early succession forest edge, and grassland and agricultural land.

We used this plan to help identify priority migratory bird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to migratory birds. The Northern New England Bird Conservation plan is available at: *http://www.partnersinflight.org/bcps/plan/pl_27_10.pdf* (assessed May 2013).

***Eastern Spruce-Hardwood Forest Bird Conservation Plan (Physiographic Area #28)***
This physiographic area includes the northern portion of the Refuge, and is the largest physiographic area in the Northeast[23]. Virtually the entire planning unit is dominated by either sugar maple-beech-birch forest, or red spruce-balsam fir forest, or a combination of the two. The region is lightly populated with concentrations found along the coast and in major river valleys. Forest management has been a significant influence on the both the economy and ecology. Generally speaking, timber management has resulted in forest landscapes that are younger with a greater dominance of northern hardwoods. Priority birds in the Refuge and within the watershed include: Bicknell's thrust, veery, bay-breasted warbler, Canada warbler, blackburnian warbler, chestnut-sided warbler, olive-sided flycatcher, spruce grouse, Cape May warbler, and American woodcock, and red crossbill. Six of the nine priority habitats in the physiographic area are found in the watershed including mature conifer (spruce-fir) forests, early succession forest edge, and freshwater wetlands.

We used this plan to help identify priority migratory bird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to migratory birds. The entire plan is available at: *http://www.partnersinflight.org/bcps/plan/pl_28_10.pdf* (assessed May 2013).

**U.S. Shorebird Conservation Plan**
The U.S. Shorebird Conservation Plan was developed for the purpose of creating conservation goals, identifying critical habitat, and promoting education and outreach programs to facilitate shorebird conservation. Several groups and individuals, including local, state, and Federal agencies, non-governmental organizations, business-related sectors, researchers, educators, and policy makers helped with the development of this plan. The plan has set goals at the hemispheric, national, and regional levels. At the regional level, the Conte Refuge is part of the North Atlantic Planning Region, which shares the boundaries of BCR 14 and 30 noted above. The plan is available online at: *http://www.shorebirdplan.org/* (assessed May 2013).

We used this plan to help identify priority shorebird species for the refuge and to develop our objectives, subobjectives, and strategies in chapter 4 and appendix A related to shorebirds.

**The Atlantic Flyway Shorebird Business Strategy – A Call to Action, Phase 1 2013**
The Atlantic Flyways Shorebird Business Strategy's Phase 1: A Call to Action was released in February 2013. This strategy contains a set of Service-coordinated shorebird actions aimed at reversing shorebird declines across the Atlantic flyway. Its overall goal is to increase current shorebird populations levels by 10 to 15 percent by 2020. The business strategy differs from other conservation plans by focusing on a set of well-developed actions that link funding to specific, measureable conservation measures. In particular, it focuses on seven key strategies: reducing threats to populations, managing and protecting habitat, strengthening conservation regulations, developing shore bird conservation constituencies, engaging partners, assessing and monitoring populations, and reducing gaps in knowledge.

To achieve this, the shorebird business strategy emphasizes prioritizing conservation actions, funding sources, and outcomes for 15 focal shorebird species. The team chose these focal species to serve as representatives for other species that share similar conservation needs to simplify and make conservation planning more efficient. Focal species include species that are either highly imperiled, of high conservation concern, represent important habitat types in the flyway, or have existing conservation plans to make implementation more practical. Of the 15 focal species, at least 5 occur in the Connecticut River watershed: greater yellowlegs, lesser yellowlegs, piping plover, red knots, and semipalmated sandpiper.

Please view the business strategy online for more information on specific objectives and details on phases 2 and 3: *http://manometcenter.pairserver.com/sites/default/files/publications_and_tools/AtlanticFlywayShorebirdBusinessStrategy.pdf* (Accessed March 2013).

**National Bald Eagle Management Guidelines (2007)**
The bald eagle is protected by the Bald and Golden Eagle Protection Act (Eagle Act) and the Migratory Bird Treaty Act (MBTA). The MBTA and the Eagle Act protect bald eagles from a variety of harmful actions and impacts. The Service developed these National Bald Eagle Management Guidelines to advise landowners, land managers, and others who share public and private lands with bald eagles when and under what circumstances the protective provisions of the Eagle Act may apply to their activities. A variety of human activities can potentially interfere with bald eagles, affecting their ability to forage, nest, roost, breed, or raise young. The guidelines are intended to help people minimize such impacts to bald eagles, particularly where they may constitute "disturbance," which is prohibited by the Eagle Act.

The guidelines are intended to:

- Publicize the provisions of the Eagle Act that continue to protect bald eagles, in order to reduce the possibility that people will violate the law.
- Advise landowners, land managers and the general public of the potential for various human activities to disturb bald eagles.
- Encourage additional nonbinding land management practices that benefit bald eagles.

While the guidelines include general recommendations for land management practices that will benefit bald eagles, the document is intended primarily as a tool for landowners and planners who seek information and recommendations regarding how to avoid disturbing bald eagles. Many States and some tribal entities have developed state-specific management plans, regulations, and/or guidance for landowners and land managers to protect and enhance bald eagle habitat, and we encourage the continued development and use of these planning tools to benefit bald eagles.

We used this plan to help develop strategies in chapter 4 and appendix A related to bald eagles. The guidelines are available online at: *http://www.fws.gov/pacific/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf* (accessed May 2013).

**Atlantic Coast Piping Plover *(Charadrius melodus)* Recovery Plan.** The only suitable habitat for the piping plover within the watershed is a mile-long sand spit at the mouth of the Connecticut River, known as Griswold Point. This beach, owned by The Nature Conservancy, provides suitable habitat for several nesting pairs.

In 1996, a revision was made to the original 1988 Atlantic Coast Piping Plover Recovery Plan (U. S. Fish and Wildlife Service 1996). The primary objective of the revised recovery program is to remove this species from

the List of Endangered and Threatened Wildlife and Plants. The plan hopes to do this by: (1) achieving well-distributed increases in numbers and productivity of breeding pairs, and (2) providing for long-term protection of breeding and wintering plovers and their habitats. The strategies within the plan provide for the ensured long-term viability of piping plover populations in the wild. The Atlantic Coast Piping Plover Recovery Plan is available at: *http://www.fws.gov/northeast/pipingplover/recovery.html*(accessed September 2013).

**Atlantic Flyway Council–Atlantic Flyway Mute Swan Management Plan 2003-2013**
Prepared by the Snow Goose, Brant, and Swan Committee, Atlantic Flyway Technical Section, Atlantic Flyway Council, July 2003. The goal of this management plan is to reduce mute swan populations in the Atlantic Flyway to levels that will minimize negative ecological impacts to wetland habitats and native migratory waterfowl and to prevent further range expansion into unoccupied areas. The management plan is available online at: *http://www.michigan.gov/documents/dnr/AFC_mute_swan_plan1_364878_7.pdf* (accessed May 2013).

**Final Environmental Impact Statement: Resident Canada Goose Management, June, 2009**
This final Environmental Impact Statement outlines various ways to reduce, manage, and control resident Canada goose populations and reduce related damage. Between 1995 and 2005, the population of resident Canada geese increased an average of 1 percent each year across the Atlantic Flyway. This increase lead to both economic and natural resource issues, including damaged private property, parks and other open spaces, and agricultural fields. The final plan is available online at: *http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/cangeese/finaleis.htm* (accessed May 2013).

**Atlantic Population of Canada Geese – Status and Management, June, 2009**
The Atlantic Population (AP) of Canada geese was once considered the largest Canada goose population in North America and the staple of waterfowl hunters in the Atlantic Flyway. Breeding surveys of key AP nesting areas in northern Quebec documented a precipitous decline in AP numbers from 118,000 nesting pairs recorded in 1988 to 29,000 pairs in 1995. This dramatic change in numbers of AP geese prompted State, Federal, and Provincial wildlife agencies in 1995 to suspend the sport hunting season of AP geese in the United States and in the Canadian Provinces of Ontario and Quebec. Since the ban was placed, the status of AP geese appears to have improved substantially. In the spring of 1997, the index of breeding pairs surveyed in the Ungava Region of Quebec increased to 63,000. The recovery of AP Canada geese will depend on renewed cooperation and involvement of all user groups to strengthen our commitment to this valuable resource. *http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/cangeese/apcangse.html*

**Association of Fish & Wildlife Agencies Resident Game Bird Working Group – Spruce Grouse Continental Conservation Plan (2007)**
The Spruce Grouse Continental Conservation Plan was been developed under the auspices of the Resident Game Bird Working Group of the Association of Fish and Wildlife Agencies. The primary objectives of the plan are to provide a range-wide estimate of population and habitat and to assemble current assessments of threats, management recommendations, and research needs on spruce grouse. The plan is available online at: *http://www.nwtf.org/NAWTMP/literature/spruce_grouse_final_plan_3-14-07.pdf* (accessed September 2013).

We used this plan to inform our proposed management strategies in chapter 4 and appendix A related to spruce grouse and their habitats.

**Vermont Fish & Wildlife Department – Vermont Recovery Plan for the Spruce Grouse (2000)**
The Vermont Recovery Plan for the Spruce Grouse goes over the history, current status, threats, and recovery plans for spruce grouse. It is believed that between 150 and 300 adult birds occur in this population and periodic surveys since 1990 show a stable if not slightly increasing population. Full recovery of spruce grouse in Vermont will require the establishment of 2 additional sub- populations, most likely on the State Lands located in the southern Essex County towns of Victory and Granby, and in the northern Essex County town of Norton.

We used this plan to inform our proposed management strategies in chapter 4 and appendix A related to spruce grouse and their habitats.

## Fish and Aquatic Resources

**U.S. Fish and Wildlife Service – Fisheries Program Northeast Region Strategic Plan (2009).** The Northeast Region Strategic Plan (USFWS 2004), developed in cooperation with over 40 partners and stakeholders, addresses the decline of fish and other aquatic resources in the Northeast Region, and the economic impact

of those declines. The plan outlines the Fisheries Programs mission, vision, and priorities for conserving fish and habitat.

We used this plan to identify priority fish species for the refuge and to help develop objectives, subobjectives, and strategies in chapter 4 and appendix A related to fish and their habitats. The plan is available online at: *http://www.fws.gov/northeast/fisheries/pdf/FisheriesStrategicPlan.pdf*(accessed September 2013).

**National Fish Habitat Action Partnership**
The National Fish Habitat Action Partnership (NFHAP) is an ambitious effort designed to address the urgent crisis of declining fish habitat nationwide. The plan was initiated in 2001and is modeled after the North American Waterfowl Management Plan, widely recognized as a huge success in facilitating wetland protection and restoration through strong "joint venture" partnerships. Fish Habitat Partnerships are the primary work units of the National Fish Habitat Action Partnership. These partnerships are formed around important aquatic habitats and distinct geographic areas (e.g., Southeast Aquatic Resources Partnership,) "keystone" fish species (e.g., eastern brook) or system types (e.g., large lakes, impoundments, estuaries). Through the Association of Fish and Wildlife Agencies, the states led development of the NFHAP in cooperation with the Service, National Marine Fisheries Service (NMFS), and other key partners. The two Federal agencies with lead fishery management responsibility, the Service and NMFS, served as the primary liaisons with other federal agencies and the Federal Caucus. For more information on NFHAP, visit: *http://fishhabitat.org/* (accessed September 2013).

Two key partnerships under the NFHAP cover the Connecticut River watershed, the Eastern Brook Trout Joint Venture (see below) and the Atlantic Coastal Fish Habitat Partnership.

***Eastern Brook Trout Joint Venture's Eastern Brook Trout: Action Strategies and Eastern Brook Trout Status and Threats***
In the U.S., brook trout are declining throughout their range (Hudy et al. 2005). In 2004, in recognition of the need to address regional and range-wide threats to wild brook trout, a group of public and private entities formed the Eastern Brook Trout Joint Venture (EBTJV) with a mission to halt the decline of brook trout and restore fishable populations. Its unique partnership has grown and now includes state and Federal agencies, regional and local governments, businesses, conservation organizations, academia, scientific societies, and private citizens. It was the nation's first pilot project under the National Fish Habitat Action Plan, and is a geographically focused, locally driven, and scientifically-based effort to protect, restore, and enhance aquatic habitat throughout the range of the Eastern brook trout. The EBTJV has developed several documents, including Conserving the Eastern Brook Trout: Action Strategies, to help prioritize and guide brook trout conservation and restoration efforts in the U.S. The plan is avaialbe at: *http://fishhabitat.org/index.php?option=com_content&view=article&id=102:ebt* (accessed September 2013). The EBTJV also developed the report "Eastern Brook Trout: Status and Threats" that identifies current threats to Eastern brook trout, proposes a general strategy to deal with these threats, and outlines potential corrective measures. Conservation strategies for Massachusetts, New Hampshire, and Vermont are available online at: *http://www.easternbrooktrout.org/conservationstrategy.aspx* (accessed September 2013).

Whenever feasible, we have used the recommendations in these reports to help develop strategies in chapter 4 and appendix A related to eastern brook trout and their habitats. Native brook trout are found on our existing divisions and units, and on several divisions proposed for acquisition in this CCP. We will continue to consult with Service and state fisheries biologists involved in the development of the EBTJV Conservation Strategy to assist us in developing objectives and strategies related to brook trout and other associated aquatic resources in future habitat management plans.

**Connecticut River Atlantic Salmon Commission – Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River (1998).**
The Strategic Plan was prepared by the Connecticut River Atlantic Salmon Commission's Technical Committee as an update to the 1982 Plan. Technical Committee members consist of the senior or lead fishery biologists for each of the four basin state agencies as well as the federal agency partners. The Plan's Goal is to protect, conserve, restore and enhance the Atlantic salmon population in the Connecticut River basin for public benefit, including recreational fishing. Since that Plan's completion, marine survival rates have been greatly reduced, impacting adult salmon returns, that from 2000 to 2009 have ranged from 40 to 214 fish. Program goals include stocking 10 million fry and 100,000 smolts annually into identified habitat. Effective downstream passage measures at hydroelectric plants continue to be worked on by the agencies. The Connecticut River Atlantic Salmon

Commission and its Technical Committee meets typically four times a year and meeting are open to the public. There are also 5 active subcommittees that deal with specific issues such as Genetics, Fish Culture, and Fish Passage and include diverse memberships from other agencies and universities. Salmon restoration and recovery program biologists from all the New England states meet annually to update the United States' annual report for the North Atlantic Salmon Conservation Organizations annual meeting which has USA delegates.
The plan is available at: *http://www.fws.gov/r5crc/pdf/strplan.pdf* (accessed September 2013). We will continue to work with partners, including the Service's Connecticut River Coordinator's Office, to identify actions the refuge can take to benefit Atlantic salmon.

**U.S. Fish and Wildlife Service – River Herring Management Plan, Connecticut River Coordinator's Office, A Management Plan for American Shad in the Connecticut River Basin (1992).** The goal of this plan is to restore and maintain a spawning shad population to its historic range in the Connecticut River basin and to provide and maintain sport and commercial fisheries for the species. Management objectives include achieving and sustaining an annual adult population of 1.5 to 2.0 million individuals entering the mouth of the Connecticut River. Another objective is to achieve annual passage of 40 to 60 percent of the spawning population (based on a 5-year running average) at each successive upstream barrier on the main stem. Adult American shad passage counts at Holyoke Fish Lift have gone from a high of 720,000 fish in 1992, to a fairly consistent substantially reduced count of 155,000 for the period 2006 to 2009. Substantial portions of the historic shad habitat in the basin is not accessible due to ineffective fishways, barriers or other issues (imprinting/genetics potentially). Declines in American shad abundance, in monitored rivers along most of the East Coast, is of great management concern at this time. Of particular concern is the fact that directed fisheries are very low or closed in many jurisdictions. The final plan is available online at: *http://www.fws.gov/r5crc/pdf/shad_management_plan.pdf* (accessed September 2013). We will continue to work with partners, including the Service's Connecticut River Coordinator's Office, to identify actions the refuge can take to help conserve American shad in the Connecticut River watershed.

**U.S. Fish and Wildlife Service – River Herring Management Plan, Connecticut River Coordinator's Office, Restoring Migratory Fish to the Connecticut River Basin (2003).**
River herring were abundant historically in streams throughout New England but have experienced a decline in this century. There is ample evidence of the existence of river herring throughout the lower Connecticut River basin. The most important factor limiting herring populations appears to be restricted access to spawning and rearing habitat due to dams. However, the population has continued to decline despite recent habitat restoration efforts, suggesting other detrimental factors like unfavorable marine conditions and/or overabundance of striped bass.

The goal of this plan is to seek to restore and maintain a spawning river herring population within its historic range in the Connecticut River basin. Other more specific management objectives include**:** Achieve and sustain annual passage of 300,000 to 500,000 adults at the Holyoke fish passage facility (this represents a return to the numbers documented in the 1980s); Achieve annual passage of 40-60% of the spawning run at each successive upstream barrier on the Connecticut River from Holyoke to Bellows Falls (based on % of habitat available between each barrier); Maximize outmigrant survival for juveniles and spent adult river herring; and Support tributary restoration programs (fish passage, barrier removal, and broodstock trap-and-transport), for a partial list. The declines in river herring documented only by passage counts at Holyoke Fish Lift have been staggering and of great management concern. In fact, since 2003, no harvest of herring has been allowed in Connecticut or Massachusetts. In 2009 a total of 39 herring were counted passing Holyoke, down from the 630,000 herring counted in 1985.

The final plan is available online at: *http://www.fws.gov/r5crc/herring_plan.html* (accessed September 2013). We will continue to work with partners, including the Service's Connecticut River Coordinator's Office, to identify actions the refuge can take to help conserve river herring in the Connecticut River watershed.

**Atlantic States Marine Fisheries Commission, Amendment 1 to the Interstate Fishery Management Plan for Shad and River Herring (1999)**
Large declines in commercial landings were perceived as an indication that management action would be required to restore American shad, hickory shad, river herring, and blueback herring stocks to their former levels of abundance The members of the Atlantic States Marine Fisheries Commission completed a cooperative Interstate Fishery Management Plan for American Shad and River Herrings in 1985. Amendment 1 to the

1985 Plan will provide management guidance, as required by ACFCMA, by setting specific standards to be met by the states. Because of the scarcity of reliable data on river herring and hickory shad populations, the ASMFC member states decided to focus Amendment I on American shad regulations and monitoring programs. The final plan is available online at: *http://pbadupws.nrc.gov/docs/ML0701/ML070170114.pdf* (accessed September 2013).

**Atlantic States Marine Fisheries Commission, Amendment 2 to the Interstate Fishery Management Plan – for Shad and River Herring (2009) (River Herring Management Plan)**
The Atlantic States Marine Fisheries Commission (Commission) is developing an amendment to its Interstate Fishery Management Plan for Shad and River Herring (FMP) under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). Shad and river herring management authority lies with the coastal states and is coordinated through the Commission. Many populations of blueback herring and river herring, have faced anthropogenic threats since colonial times, including fishing and both habitat loss and degradation. The closure of river herring fisheries by Atlantic coastal states and observed declines in river herring abundance have led to questions about the adequacy of current management of the species to promote healthy fish stocks. The Commission and the public have also expressed concern over the lack of monitoring of river herring populations, fisheries and by catch. This document has been developed to address these questions and concerns. The final plan is available online at: *http://www.asmfc.org/speciesDocuments/shad/fmps/amendment2_RiverHerring.pdf* (accessed September 2013).

**Final Recovery Plan for the Shortnose Sturgeon (1998), National Marine Fisheries Service**
Shortnose sturgeons were originally listed as an endangered species by the FWS on March 11, 1967 under the Endangered Species Preservation Act (32 FR 4001, Appendix I). More than a century of extensive fishing for sturgeon contributed to the decline of Atlantic and shortnose sturgeon populations along the east coast. Heavy industrial development during the twentieth century in rivers inhabited by sturgeon impaired water quality and impeded these species' recovery. This Recovery Plan provides a framework for addressing a multitude of biological concerns, and outlines federal agency responsibilities under the Endangered Species Act, with the sole purpose of insuring long-term survival of the shortnose sturgeon. The final recovery plan is available at: *http://www.nmfs.noaa.gov/pr/pdfs/recovery/sturgeon_shortnose.pdf* (accessed September 2013).

We will continue to work with partners, including the Service's Connecticut River Coordinator's Office, to identify actions the refuge can take to help conserve shortnose sturgeon in the Connecticut River watershed.

**Atlantic States Marine Fisheries Commission, Interstate Fishery Management Plan for American Eel (2000), including subsequent addendums (2006 and 2008)**
This fishery management plan describes the current status of the American eel, threats and ecological challenges affecting eels, goals and objectives for the species and management actions needed to achieve these goals. The two main goals are:

- Protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic States and jurisdictions and contribute to the viability of the American eel spawning population.

- Provide for sustainable commercial, subsistence, and recreational fisheries by preventing overharvest of any eel life stage.

The plan, available at: *http://www.asmfc.org/* (accessed September 2013), also identifies issues facing eels that need additional research. The 2006 addendum updated the plan to establish a mandatory catch and effort monitoring program for American eels, while the 2008 addendum recommended stronger regulatory language to improve upstream and downstream passage of American eel to state and Federal regulatory agencies.

We will continue to work with partners, including the Service's Connecticut River Coordinator's Office, to identify actions the refuge can take to help conserve American eel in the Connecticut River watershed.

**Dwarf Wedgemussel *(Alasmidonta heterodon)* Recovery Plan**
This mussel is known from several sites on the main stem of the Connecticut River and several major tributaries (Mosher 1993). It was listed as federally endangered in 1990 following documentation of substantial population losses. A recently completed 5-year review considered the populations in the watershed to be stable

(U.S. Fish and Wildlife Service 2007). The Connecticut River population has the largest remaining population consisting of three distinct segments separated by dams. The recovery plan and 5-year review are available at: *http://ecos.fws.gov/docs/recovery_plan/930208b.pdf* and *http://ecos.fws.gov/docs/five_year_review/doc1098.pdf* (accessed September2013).

We will continue to work with partners, including the Service's Connecticut River Coordinator's Office, to identify actions the refuge can take to help conserve dwarf wedgemussel in the Connecticut River watershed.

## Mammals

**U.S. Fish and Wildlife Service – Recovery Outline: Contiguous United States Distinct Population of the Canada Lynx (2005)**
This document serves as an interim strategy to guide recovery efforts and inform the critical habitat designation process for the contiguous United States population of the Canada lynx until a draft recovery plan has been completed. This outline provides a general overview of the available information on the contiguous United States lynx distinct population segment, and provides preliminary recovery objectives and actions based on our understanding of current and historical lynx occurrence and lynx population dynamics in the contiguous United States. Thie recover outline is available online at: *http://www.fws.gov/mountain-prairie/species/mammals/lynx/final%20lynx%20recoveryoutline9-05.pdf* (accessed September 2013).

We used this document to help develop objectives, subobjectives, and strategies in chapter 4 and appendix A related to Canada lynx. We also continue to conduct research on the refuge and work with the Service's New England Ecological Services Field Office to identify the latest information on lynx. We will use this information to help develop more specific management strategies to benefit lynx in future habitat management plans.

**U.S. Fish and Wildlife Service – New England Cottontail (*Sylvilagus transitionalis*) Spotlight Species Action Plan (2009)**
The New England cottontail is a candidate species for Federal listing under the Endangered Species Act. The New England cottontail requires very specific habitat conditions and relies on thicket habitats which are declining through its historic range due to development, changes in land use, and forest succession. The goal of the New England Cottontail Spotlight Species Action Plan is to reduce the amount of habitat-based threats to New England cottontails. Strategies highlighted in the plan include: managing refuge habitats for New England cottontail, working with the Natural Resources Conservation Service to encourage landowners to manage thicket habitat, and coordinating conservation efforts among Federal agencies, States, and other conservation groups. The spotlight action plan is available online at: *http://ecos.fws.gov/docs/action_plans/doc3081.pdf* (accessed September 2013).

We used this information to help determine areas proposed for refuge land acquisition and to develop objectives, subobjectives, and strategies in chapter 4 and appendix A related to New England cottontails and their habitats.

## Invertebrates

**Puritan Tiger Beetle *(Cicindela puritana)* Recovery Plan**
Distribution in the watershed is limited to a meta-population in Connecticut and a small, singular population in Massachusetts (U. S. Fish and Wildlife Service 1993). Both are found on beaches along the main stem of the Connecticut River. The Service owns a tract of land that supports part of the Connecticut population. The rest of the suitable habitat is in a mix of ownerships.

A recently completed of 5-year review updates the status of this beetle (U. S. Fish and Wildlife Service 2007). The Connecticut meta-population showed a general upward trend, except during the two year period before the report was published. Although the Massachusetts population is small, there have been some recent increases, probably related to larval augmentation efforts lead by the Refuge. The original recovery plan and 5-year review can be viewed at: *http://ecos.fws.gov/docs/recovery_plan/930929a.pdf* and *http://ecos.fws.gov/docs/five_year_review/doc1114.pdf* (accessed September 2013).

We used this information to develop objectives, subobjectives, and strategies in chapter 4 and appendix A related to puritan tiger beetles and their habitats, particularly for the refuge's Dead Man's Swamp Unit.

## Rare Plants, Wetlands, and Other Natural Communities

**Northeastern Bulrush *(Scirpus ancistrochaetus)* Recovery Plan**
This endangered emergent, wetland plant ranges from Maryland and Virginia to New England (U.S. Fish and Wildlife Service 1993). It is found in the deeper emergent zones of small wetlands characterized by variable water levels. Habitat loss and pollution were key factors in the decline of this bulrush. One population is found on an existing unit of the Conte Refuge. The recovery plan is available at: *http://ecos.fws.gov/docs/recovery_plan/930825.pdf* (accessed September 2013).

We used this information to develop objectives, subobjectives, and strategies in chapter 4 and appendix A related to northeastern bulrush, particularly for the refuge's Putney Mountain Unit.

**Jesup's Milkvetch *(Astragalus robbinsii var. jesupii)* Recovery Plan**
This plant exists only in the Connecticut River watershed and is confined to calcareous bedrock outcrops which are annually ice scoured (U.S. Fish and Wildlife Service 1989). The three known sites occur along a 16-mile stretch of the Connecticut River in the towns of Plainfield and Claremont, NH and Hartland, VT. Habitat alteration and collecting have been the major threats to this plant. More recently, invasive plant species have also become a threat. Trampling of plants by people portaging canoes and kayaks also poses a threat to one site. The recovery plan is found at: *http://ecos.fws.gov/docs/recovery_plan/891121.pdf* (accessed September 2013).

Currently, this species does not occur on any refuge lands. We will continue to work with partners to help conserve this species.

**Small Whorled Pogonia *(Isotria medeoloides)* Recovery Plan**
This threatened plant inhabits upland sites in mixed-deciduous or mixed-deciduous/coniferous forests in second or third growth successional stages. It is rare but widely occurring at about 85 sites in 15 states and Canada (U.S. Fish and Wildlife Service 1992). There are only two known small populations within the Connecticut River watershed, one in Connecticut and one in Massachusetts. Destruction of habitat from commercial and residential development has been a primary threat to the species. Plant collectors decimated the only know population in Connecticut several years ago after its location was published in a newspaper. The recovery plan can be reviewed at: *http://ecos.fws.gov/docs/recovery_plan/921113b.pdf* (accessed September 2013).

Currently, this species does not occur on any refuge lands. We will continue to work with partners to help conserve this species.

**U.S. Fish & Wildlife Service – Natural Communities and Rare Plants in the Nulhegan Basin Division (2002)**
In 2002, the natural communities of Nulhegan Basin Division and nearby West Mountain Wildlife Management area were inventoried and mapped. As part of this study, rare, uncommon, and invasive plants were inventoried on the refuge as well. We used this report to help identify priority habitats, natural communities, and plant species for the refuge.

**The Nature Conservancy – The Active River Area: A Conservation Framework for Protecting Rivers and Streams, 2008.**
This Nature Conservancy (TNC) publication is a comprehensive guide to preserving rivers and streams. River health depends on a wide array of processes that require dynamic interaction between the water and land through which it flows. The areas of dynamic connection and interaction, or "active river areas," provide a frame of reference from which to conserve, restore and manage river systems. The guide uses this "active river area framework" to offer a more holistic vision of a river than solely considering the river channel as it exists in one place at one particular point in time. Rather, the river becomes those lands within which the river interacts both frequently and occasionally.

We used this plan to help develop our objectives, subobjectives, and strategies in chapter 4 and appendix A for rivers and riparian areas. This publication is available online at: *http://www.floods.org/PDF/ASFPM_TNC_Active_River_%20Area.pdf* (accessed May 2013).

## State Comprehensive Wildlife Conservation Strategies/Wildlife Action Plans

In 2002, Congress created the State Wildlife Grant Program and appropriated $80 million in grants to states. The purpose of the program is to help state and Tribal fish and wildlife agencies conserve fish and wildlife species of greatest conservation need. These grants are available to state fish and wildlife agencies "for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished."

To be eligible for these grants, each state and U.S. territory had to develop a statewide "Comprehensive Wildlife Conservation Strategy" by October 1, 2005, commonly known as the State Wildlife Action Plan. Each plan identifies the "species of greatest conservation need," yet address the "full array of wildlife" and wildlife-related issues, and is designed to "keep common species common." In brief, these plans employ adaptive management and include information on the distribution and abundance of species of wildlife; key habitats and community types; descriptions of problems and solutions of adversely affect species; priority conservation actions; monitoring priorities for species and their habitats; provide for plan evaluation procedures; and include steps incorporating review by state, federal and Tribal conservation agencies and organizations, and review by the public.

In developing this draft CCP/EIS, we used the state wildlife action plans from the four states in the Connecticut River watershed (Connecticut, Massachusetts, New Hampshire, and Vermont) to supplement information on species and habitats and their distribution in our in the Connecticut River watershed, help us identify priority species and habitats for the refuge, and develop management strategies for species and habitats of conservation concern in chapter 4 and appendix A of the draft CCP/EIS.

The four plans are available online at (all accessed September 2013):

- Connecticut Comprehensive Wildlife Conservation Strategy (2005): *http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719*
- Massachusetts Comprehensive Wildlife Conservation Strategy (2005): *http://www.mass.gov/eea/agencies/dfg/dfw/wildlife-habitat-conservation/massachusetts-wildlife-conservation-strategy.html*
- New Hampshire Comprehensive Wildlife Conservation Strategy (2005): *http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm*
- Vermont Comprehensive Wildlife Conservation Strategy (2005): *http://www.wildlifeactionplan.org/sites/default/files/Vermont%20Wildlife%20Action%20Plan.pdf*

## Invasive Species

**The National Strategy for Management of Invasive Species – National Wildlife Refuge System**
This Refuge System strategy establishes a comprehensive plan for dealing with the critical problem of invasive species on refuges, and generally within the United States. Developed within the context of the National Invasive Species Management Plan (as called for by Presidential Executive Order 13112), this National Strategy provides clear guidance to regional and field offices as they conduct invasive species management efforts. It facilitates making refuges better neighbors to our external partners at the local, state, and Federal level. The National Strategy provides specific action items to achieve the following four invasive species management goals: 1) increase awareness; 2) reduce the impacts to refuge habitats; 3) reduce impacts to neighboring lands; and 4) use and develop new integrated pest management approaches. The plan is available online at: *http://www.fws.gov/invasives/pdfs/NationalStrategyFinalRevised05-04.pdf* (accessed September 2013).

**New England Invasive Plant Group**
The New England Invasive Plant Group (NIPGro) is spearheaded by and headquartered at the Silvio O. Conte National Fish and Wildlife Refuge, networks agencies, organizations, and individuals concerned about invasive plant issues in the region. NIPGro promotes the sharing of information among network members, research

into plant biology and management techniques, alternatives to invasive species still in use, and provides a clearinghouse and referral system for information. Electronic newsbriefs and a periodic newsletter give updates about new invaders, projects being undertaken by members, upcoming events, new research, and more. For more information on NIPGro, visit: *http://www.eddmaps.org/ipane/relatedinfo/NIPGro.htm* (accessed September 2013).

**The Invasive Plant Control Initiative Strategic Plan for the Connecticut River Watershed/Long Island Sound Region, Silvio O. Conte National Fish and Wildlife Refuge.** The refuge is very active in invasive plant issues and coordinates the activities of the New England Invasive Plant Group (see above). The refuge developed the Invasive Plant Control Initiative Strategic Plan, which highlights agencies and organizations already working on invasive plant issues in the watershed and New England, identifies needs, and describes the actions that would best serve the region within the 5 years between1999 to 2004. Many of the priority actions listed in the plan are being undertaken by various agencies and organizations. We also include some of the plans action as strategies in chapter 4 and appendix A.

**Invasive Plant Atlas of New England (IPANE)**
The Invasive Plant Atlas of New England (IPANE), based at the University of Connecticut, is a Web-based informational resource, including a regional atlas, of approximately 100 species known or suspected to be invasive in New England. The atlas supports an early detection and alert system for new invaders. The IPANE Web site includes images and descriptive data, identification tips, management links and a database documenting the existence and spread of species in New England. IPANE data are used to detect new invaders; understand the habitat requirements of each species; ascertain patterns of spread, and model the likely "potential distribution" of various species. Current field data are collected and submitted by volunteers trained by the New England Wild Flower Society and trained professionals. The website includes a wide range of other information about invasive plants in New England: *http://www.eddmaps.org/ipane/* (accessed September 2013).

## Watershed Plans

**Connecticut River Joint Commissions – Connecticut River Water Resources Management Plan, Riverwide Overview (2009)**
The Connecticut River is New England's largest and most powerful river. This plan encourages continued economic development that is compatible with the well-being of the river. Stewardship of both the quality and the quantity of water flowing in the river is the responsibility of us all. This plan aims to stimulate stewardship and build partnerships across town lines, across the river, and across the array of interests of those who live and work on each side, aided by state and federal agencies with an interest in safeguarding the river's resources. The plan is available online at: *http://www.crjc.org/pdffiles/WATER.final.pdf* (accessed September 2013).

**Connecticut River Watershed Plan – Massachusetts (2003)**
This 5-year Watershed Action Plan (2003-2007) covers the Connecticut River watershed in Massachusetts, and builds upon other planning efforts as well as those conducted by other local, state, and Federal agencies. The Action Plan provides a framework for the implementation of short-term projects to help address the Massachusetts State Executive Office of Environmental Affairs' five priority issues within the Connecticut River watershed:

1. Riparian corridors.
2. Water quality and nonpoint source pollution.
3. Water quantity.
4. Wildlife habitat and fish passage.
5. Public access and recreation.

The plan addresses these priority issues and identifies potential partner organizations and additional funding sources that could be used to implement the proposed watershed projects. The plan is available at: *http://www.mass.gov/eea/docs/eea/water/wap-connecticut-2003.pdf (accessed September 2013).*The Massachusetts State Executive Office of Environmental Affairs also prepared or provided funding for 5-year Watershed Action Plans for three major tributary rivers including the Deerfield River (2004-2008*; http://www.mass.gov/eea/docs/eea/water/wap-deerfield-2004.pdf*), Miller's River (2005-2009; *http://www.mass.gov/eea/docs/eea/water/wap-millers-2004.pdf*) and Chicopee River (2005-2010; *http://www.mass.gov/eea/docs/eea/water/wap-chicopee-river.pdf*).

**Long Island Sound Study**
The 11,000 square mile Connecticut River watershed is by far the largest watershed draining into Long Island Sound, and is one of nine watersheds that are part of the Long Island Sound Study. In 1994, the states of Connecticut and New York and the United States Environmental Protection Agency approved the Comprehensive Conservation and Management Plan for Long Island Sound under EPA's National Estuary Program. Developed by the Long Island Sound Study, the Plan identifies the specific commitments and recommendations for actions to improve water quality, protect habitat and living resources, educate and involve the public, improve the long-term understanding of how to manage the Sound, monitor progress, and redirect management efforts.

Using the plan as a blueprint, the Long Island Sound Study has continued to refine and add detail to commitments and priorities, including with the 1996 Long Island Sound Agreement and the 2003 Long Island Sound Agreement. Some of the key aspects of the Long Island Sound Study for habitat management are to establish a soundwide system of reserves, consisting of the most significant and essential habitats, use of existing state and federal programs to restore and enhance tidal wetlands and other habitats, and use of existing state and federal programs to manage and restore populations of harvestable and endangered and threatened species. The Policy Committee of the Long Island Sound Study (LISS), consisting of the environmental commissioners for the states of Connecticut and New York, and the area regional administrators of the U.S. Environmental Protection Agency, met on Sept. 28, 2006 to establish the inaugural areas of the Long Island Sound Stewardship Initiative, develop guidelines to disburse $6 million in research as part of a cross sound cable fund; and to update strategies to fulfill the objectives of the cleanup plan for Long Island Sound. The plan is located at: *http://longislandsoundstudy.net/wp-content/uploads/2011/10/management_plan.pdf* (accessed September 2013).

## Recreation Plans

**Connecticut River Recreation Management Plan (2009)**
The Connecticut River Recreation Management Plan represents an updated and expanded discussion of recreation-related issues raised in the 1997 Connecticut River Corridor Management Plan. The 1997 plan, created by the Connecticut River Joint Commissions (CRJC) in cooperation with their five local subcommittees, fulfills the requirements of RSA 483, the New Hampshire Rivers Management and Protection Act. Focusing on recreation issues of river-wide significance in New Hampshire and Vermont, this overview is based upon discussions by the Connecticut River Joint Commissions (CRJC) and its five local river management advisory subcommittees for the Headwaters, Riverbend, Upper Valley, Mount Ascutney, and Wantastiquet regions. Each region created its own distinct plan, yet many of the same themes emerge and are reflected in CRJC's overview of the issues and opportunities that are important throughout the Connecticut River valley. The Commissions consulted a wide range of studies and findings for this document, including the most recently completed Comprehensive Statewide Outdoor Recreation Plans for New Hampshire and Vermont. The plan is available online at: *http://www.crjc.org/pdffiles/Connecticut_River_Rec_Management_Plan-Web.pdf* (accessed November 2013).

## Statewide Comprehensive Outdoor Recreation Plans (SCORP)

The Federal Land and Water Conservation Fund (LWCF) program provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities. The program is intended to create and maintain a nationwide legacy of high quality recreation areas and facilities and to stimulate non-federal investments in the protection and maintenance of recreation resources across the

United States. The SCORP satisfies a requirement of (LWCF) that each state have an approved SCORP on file with the National Park Service (NPS) in order to participate in the LWCF program. It also typically fulfills each state's own statutory requirement that there be an outdoor recreation planning program. The four states within the Connecticut River's watershed all have SCORPs (all accessed September 2013):

- Connecticut Statewide Comprehensive Outdoor Recreation Plan (2011-2016)
- *http://www.ct.gov/deep/lib/deep/outdoor_recreation/scorp/scorp_2011_webversion.pdf*
- Massachusetts Statewide Comprehensive Outdoor Recreation Plan (2012)
- *http://www.mass.gov/eea/docs/eea/dcs/draft-scorp.pdf*
- New Hampshire Statewide Comprehensive Outdoor Recreation Plan (2013-2018) *http://www.nhstateparks.org/who-we-are/division/reports.aspx*
- Vermont Statewide Comprehensive Outdoor Recreation Plan (2005-2009)
- *http://www.vtfpr.org/recreation/scorp/home.cfm*

## Other Regional Information Sources

We also consulted the plans and resources below as we refined our management objectives and strategies, especially those with a local context (all accessed September 2013).

**Connecticut**
The Connecticut Statewide Forest Resource Plan 2004-2013: *http://www.ct.gov/dep/cwp/view.asp?A=2697&Q=322794*

**Massachusetts**
Applicable District Forest Resource Management Plans from the Massachusetts Department of Conservation and Recreation: *http://www.mass.gov/eea/agencies/dcr/conservation/forestry-and-fire-control/forest-management-planning.html*

**New Hampshire**
New Hampshire Forest Resources Plan: *http://extension.unh.edu/resources/files/Resource000213_Rep231.pdf*

White Mountain National Forest Plan:
*http://www.fs.usda.gov/whitemountain*

Connecticut Lakes Natural Area Stewardship Plan: *http://www.wildlife.state.nh.us/Wildlife/CT_Lakes/CT_Lakes_NA_plan_041906.pdf*

**Vermont**
Green Mountain National Forest Plan:
*http://www.fs.usda.gov/greenmountain*

The Vermont Division of Forestry, Forest Resource Plan 1999-2008: *http://www.vtfpr.org/forplan/*

Vermont Department of Forests, Parks, and Recreation Management Plan for the Former Champion Lands*: http://www.vtfpr.org/lands/champion.cfm*

**Connecticut River**
Connecticut River Joint Commissions, Connecticut River Management Plan: *http://www.crjc.org/corridor-plan/plan-TOC.html*

The Nature Conservancy's Connecticut River project: *http://www.nature.org/wherewework/northamerica/states/connecticut/preserves/art22544.html?src=search*

Trust for Public Lands, Connecticut River Program: *http://www.tpl.org/what-we-do/where-we-work/massachusetts/connecticut-river.html*

**New England**
Northern Forest Canoe Trail plan; available online at *http://www.northernforestcanoetrail.org/*

Appalachian Trail, National Park Service, Strategic Plan and other resources: *http://www.nps.gov/appa/naturescience/upload/AT_Resource_Management_Plan_Ch_1.pdf*

Connecticut River Watershed Council, Inc., The Connecticut River Boating Guide: Source to Sea, 2007 *http://ctriver.org/publications*

Appendix N

Maddie List/USFWS

*Great Falls Discovery Center*

# List of Partnerships

- Federal Agencies
- Multi-agency and Organization Groups
- State of Connecticut Agencies
- State of Massachusetts Agencies
- State of New Hampshire Agencies
- State of Vermont Agencies
- Towns and Local Governments
- Non-governmental Conservation Organizations and Groups
- Recreational Groups
- Environmental Education Groups and Centers
- Academic Institutions
- Refuge Friends Groups

Partnerships are the foundation of all the Silvio O. Conte National Fish and Wildlife Refuge's conservation work. By collaborating with others, our efforts are more effective and have longer lasting and greater positive impacts on the Connecticut River watershed's rich natural, cultural, and economic resources. Together, we can also offer a greater range of nature-based recreational and environmental education opportunities. This appendix lists some of the partners that the Silvio O. Conte Refuge works with to achieve our mutual conservation, recreation, and education goals. This list is not meant to be exhaustive, but rather to highlight the extent and importance of the network of conservation partnerships that exists in the Connecticut River watershed. We apologize to any groups that may have been inadvertently left off this list.

## Federal Agencies

- Green Mountain National Forest
  *http://www.fs.usda.gov/greenmountain*

- National Park Service
  *http://www.nps.gov/index.htm*

- U.S. Department of Agriculture – National Resource Conservation Service
  *http://www.nrcs.usda.gov/*

- U.S. Department of Agriculture – U.S. Forest Service
  *http://www.fs.fed.us/*

- U.S. Army Corps of Engineers
  *http://www.usace.army.mil/*

- U.S. Department of Commerce – National Oceanic and Atmospheric Administration
  *http://www.noaa.gov*

- U.S. Department of Transportation
  *http://www.dot.gov/*

- U.S. Department of Defense
  *http://www.defense.gov/*

- U.S. Geological Survey
  *http://www.usgs.gov/*

- White Mountain National Forest
  *http://www.fs.usda.gov/whitemountain*

## Multi-agency and Organization Groups

- Connecticut River Joint Commissions
  *http://www.crjc.org/*

- Connecticut River National Blueway System

- North Atlantic Landscape Conservation Cooperative
  *http://www.northatlanticlcc.org/*

- Northeast Climate Science Center
  *http://www.doi.gov/csc/northeast/index.cfm*

## State of Connecticut Agencies

- Department of Energy and Environmental Protection
  *http://www.ct.gov/deep/*

- Connecticut Agricultural Experiment Station
  *http://www.ct.gov/caes/*

## State of Massachusetts Agencies

- Massachusetts Department of Fish and Game
  *http://www.mass.gov/eea/agencies/dfg/*

## State of New Hampshire Agencies

- New Hampshire Fish and Game
  *http://www.wildlife.state.nh.us/*

## State of Vermont Agencies

- Vermont Fish and Wildlife Department
  *http://www.vtfishandwildlife.com/*

## Towns and Local Governments

- Essex County Natural Resources Conservation District
  *http://www.vacd.org/conservation-districts/essex-county*

- Local conservation commissions throughout the watershed

- Town selectboards and municipal governments in towns and cities with refuge land

## Non-governmental Conservation Organizations and Groups

- Center for Northern Forest Research
  *http://cnfr.us/index.php*

- Connecticut River Watershed Council
  *http://www.ctriver.org/*

- Cooperative Invasive Species Management Areas Partnerships

- Harvard Forest
  *http://harvardforest.fas.harvard.edu/*

- Highstead Arboretum
  *http://highsteadarboretum.org/*

- Monadnock Conservancy
  *http://www.monadnockconservancy.org/*

- National Wildlife Refuge Association
  *http://refugeassociation.org/*

- Northeast Kingdom Audubon
  *http://nekaudubon.net/*

- Orange Country Headwaters Project
  *http://orangecountyheadwaters.org/*

- Quabbin to Cardigan Collaborative
  *http://q2cpartnership.org/*

- Society for the Protection of New Hampshire Forests
  *http://www.forestsociety.org/*

- The Conservation Fund
  *http://www.conservationfund.org/*

- The Nature Conservancy
  *http://www.nature.org/*

- The Trust for Public Land
  *http://www.tpl.org/*

- The Trustees of Reservations
  *http://www.thetrustees.org/*

- Trout Unlimited
  *http://www.tu.org/*

- Upper Valley Land Trust
  *http://www.uvlt.org/*

- Vermont Land Trust
  *http://www.vlt.org/*

## Recreational Groups

- Appalachian Mountain Club
  *http://www.outdoors.org/*

- Connecticut River Paddlers' Trail
  *http://www.connecticutriverpaddlerstrail.org/*

- Putney Mountain Association
  *http://www.putneymountain.org/*

- Northern Forrest Canoe Trail
  *http://www.northernforestcanoetrail.org/*

## Environmental Education Groups and Centers

- Great Falls Discovery Center
  *http://greatfallsdiscoverycenter.org/*

- Great Northwoods Visitor Center
  *http://www.fws.gov/r5soc/come_visit/great_northwoods_center.html*

- Montshire Museum of Science
  *http://www.montshire.org/*

- Northwoods Stewardship Center
  *http://www.northwoodscenter.org/*

- Siskin Ecological Adventures
  *http://siskinea.org/*

- Springfield Museums
  *http://www.springfieldmuseums.org/*

- Vermont Institute of Natural Science
  *http://www.vinsweb.org/*

## Academic Institutions

- Mount Holyoke College
  *https://www.mtholyoke.edu/*

- Smith College
  *http://smith.edu/*

- University of Connecticut
  *http://www.uconn.edu/*

- University of Maine
  *http://www.umaine.edu/*

- University of Massachusetts
  *http://www.umass.edu/*

- University of New Hampshire
  *http://www.unh.edu/*

- University of Vermont
  *http://www.uvm.edu/*

- Westfield State University
  *http://www.westfield.ma.edu/*

## Refuge Friends Groups

- Friends of the Connecticut River Paddlers Trail

- Friends of Silvio O. Conte National Fish and Wildlife Refuge

- Friends of Fort River

- Friends of Great Falls Discovery Center
  *http://greatfallsdiscoverycenter.org/*

- Friends of the Nulhegan Basin
  *http://friendsofthenulhegan.com/*

- Friends of Pondicherry Wildlife Refuge

- Friends of Roger Tory Peterson Unit

- Friends of Salmon River

**Silvio O. Conte National Fish and Wildlife Refuge**
**103 E. Plumtree Road**
**Sunderland, MA 01375**
**413/548 8002**
***http://www.fws.gov/refuge/Silvio_O_Conte/***

**Federal Relay Service**
**for the deaf and hard-of-hearing**
**1 800/877 8339**

**U.S. Fish & Wildlife Service**
***http://www.fws.gov***

**For Refuge Information**
**1 800/344 WILD**

**August 2015**