U.S. Fish & Wildlife Service

Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area

Draft Comprehensive Conservation Plan and Environmental Assessment

April 2013

Front Cover:

Aerial view of Sunkhaze Meadows Unit.
Cheryl Daigle and Friends of Sunkhaze Meadows NWR.

Back Cover:

Lily pads at Carlton Pond.
Danielle D'Auria

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 150-million acre National Wildlife Refuge System comprised of more than 550 national wildlife refuges and thousands of waterfowl production areas. It also operates 70 national fish hatcheries and 81 ecological services field stations. The Service 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 provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

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Refuge Vision Statement

Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area are a tapestry of natural lands within central Maine.

The Sunkhaze Meadows Unit supports an expansive, intact peat bog system. The free-flowing Sunkhaze Stream and its tributaries meander through diverse habitats including raised peat domes, grassy wet meadows, and floodplain forests before joining the restored Penobscot River. Mature upland forests surround the wetlands, protecting this unspoiled landscape for future generations of plants, animals, and people.

Bobolink and sedge wren sing and woodcock dance in the large contiguous grassland and deer overwinter in the forest mosaic comprising the Benton Unit. Wood turtles and rare mussels are protected by the wide, shaded riparian forests of the Sandy Stream Unit.

Carlton Pond Waterfowl Production Area is a beautiful wetland jewel amidst a pastoral landscape. Rare black terns nest in the emergent marsh, while bald eagles, bitterns, and marsh wrens forage amid the shallow open waters and emergent pickerelweed and wild rice.

Visitors experience nature and find respite there throughout the year. In spring, birders observe migratory waterfowl and songbirds. Wildlife enthusiasts and anglers enjoy fishing, paddling and hiking throughout summer. Hunters spend crisp autumn mornings stalking their prey. In winter, people snowshoe and ski through the silent woods. Through our close partnerships and programs, visitors gain further appreciation of conservation and are inspired stewards of nature.

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Summary

Type of Action:	Administrative—Development of a Comprehensive Conservation Plan
Lead Agency:	U.S. Department of the Interior, Fish and Wildlife Service
Location:	Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Kennebec and Penobscot Counties, Maine
Administrative Headquarters:	Maine Coastal Islands National Wildlife Refuge Complex Rockland, ME
Responsible Official:	Wendi Weber, Regional Director, Region 5, Northeast
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This draft Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) analyzes three alternatives for managing the 11,876-acre Sunkhaze Meadows National Wildlife Refuge and the 1,068-acre Carlton Pond Waterfowl Production Area (WPA) over the next 15 years. This document also contains six appendixes that provide additional information supporting our analysis. Following is a brief overview of each alternative:

Alternative A: This alternative is referred to as our "No Action" or "Current Management" alternative, as required by the National Environmental Policy Act (NEPA). Under this alternative, no major changes to our biological, public use, or administrative management practices would occur.

Alternative B: This is the Service's preferred alternative. It represents the objectives and strategies recommended by the planning team for best achieving the refuge's and WPA's purposes, vision, and goals and responding to issues. Under this alternative, we continue to focus on conserving the Sunkhaze Meadows peatland-wetland complex, maintaining late successional forest habitats, and managing grassland and shrubland where currently present. With the eventual addition of proposed staff, we would also expand programming and some infrastructure for public use.

Alternative C: This alternative also prioritizes conserving the Sunkhaze Meadows peatland-wetland complex. However, this alternative proposes expanding young forest and shrubland habitats. With the eventual addition of proposed staff, we would also expand programming and infrastructure for public use.

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Chapter 1

USFWS

Welcome sign at Sunkhaze Meadows National Wildlife Refuge

Purpose of, and Need for, Action

- **Introduction**
- **Purpose of, and Need for, the Proposed Action**
- **Service and Refuge System: Policies and Mandates Guiding Planning**
- **History and Establishing Purposes**
- **Conservation Plans and Initiatives Guiding the Proposed Action**
- **Refuge and WPA Vision**
- **Refuge and WPA Goals**
- **The Comprehensive Conservation Planning Process**
- **Issues, Concerns, and Opportunities**
- **Plan Amendment and Revision**

Introduction

Sunkhaze Meadows National Wildlife Refuge (Sunkhaze Meadows NWR, refuge) and Carlton Pond Waterfowl Production Area (Carlton Pond WPA) are managed by the U.S. Fish and Wildlife Service (USFWS, Service, we, our) as part of the National Wildlife Refuge System (Refuge System). The Refuge System maintains the biological integrity, diversity, and environmental health of these natural resources for the benefit of present and future generations. Sunkhaze Meadows NWR and Carlton Pond WPA are managed by the staff of Maine Coastal Islands National Wildlife Refuge Complex.

This draft comprehensive conservation plan (CCP) and environmental assessment (EA) for Sunkhaze Meadows NWR and Carlton Pond WPA combines two documents required by Federal laws:

- A CCP, required by the National Wildlife Refuge System Administration Act of 1996, as amended by the National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57; 111 Stat. 1253; Refuge Improvement Act).
- An EA, required by the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq., 83 Stat. 852; NEPA).

This document also conforms to Service policy and legal mandates (see “Service and Refuge System: Policies and Mandates Guiding Planning” section below).

Following the public review of this draft CCP and EA, the Service’s Regional Director will decide on the components of a final CCP to guide refuge management decisions over the next 15 years. The Service will use the CCP to promote understanding of, and support for, refuge management among State agencies in Maine, Tribal governments, our conservation partners, local communities, and the public.

This draft CCP and EA has six chapters and six appendices. This first chapter sets the stage for the subsequent chapters. Specifically, chapter 1, “Purpose of, and Need for, Action”:

- Explains the purpose of, and need for, a CCP and EA for the refuge.
- Defines the project area.
- Presents the mission, policies, and mandates affecting the development of this plan.
- Identifies other conservation plans used as references in the development of this plan.
- Lists the purposes for which the refuge was established.
- Presents the vision and goals that drive refuge management.
- Describes refuge operational (or “step-down”) plans.
- Describes the planning process and its compliance with NEPA regulations.
- Describes the key issues, concerns, and opportunities addressed in the draft plan.

Chapter 2, “Affected Environment,” describes the physical, biological, and human environments of the refuge and WPA, including the land acquisition history of refuge units and the WPA.

Chapter 3, “Alternatives Considered, Including the Service-preferred Alternative,” presents three proposed management alternatives for the refuge and WPA, each with different objectives and strategies for meeting the specified goals and addressing public issues, along with activities that are expected to occur on these lands regardless of the alternative selected for the final CCP.

Chapter 4, “Environmental Consequences,” assesses the environmental consequences of implementing each of the three proposed management alternatives, predicting the foreseeable benefits and consequences affecting the socioeconomic, physical, cultural, and biological environments described in chapter 2.

Chapter 5, “Consultation and Coordination,” summarizes how the Service involved the public and its partners in the planning process; their involvement is vital for the future management of the refuge and WPA and all other Refuge System lands.

Chapter 6, “List of Preparers,” credits Service and non-Service contributors to the draft CCP and EA.

A series of appendixes, a glossary with acronyms, and a list of references provide additional documentation and references to support the developed narratives and analysis in the plan.

Purpose of, and Need for, the Proposed Action

Our proposed action is to develop a CCP for the refuge and WPA that guides refuge management over the next 15 years.

NEPA regulations require our evaluation of a reasonable range of alternatives, including a proposed or preferred action and no action. The no-action alternative can be either (1) taking no management action, or (2) not changing current management. In this CCP, alternative A, is the “no action” alternative, and it describes our current management priorities and activities, and serves as a baseline for comparing and contrasting the other alternatives and how well each meets the purpose of, and need for, a CCP. All alternatives will be evaluated and compared as to how well they meet the purpose of, and need for, a CCP.

The *purpose* of the CCP is to develop a management direction that best achieves the refuge and WPA purposes; attains the vision and goals developed for the refuge and WPA (see section 1.7); contributes to the Refuge System mission; addresses key issues and relevant mandates; and is consistent with sound principles of fish and wildlife management.

There are several reasons a CCP is *needed* for these areas. First, the Refuge Improvement Act requires national wildlife refuges to develop CCPs to help fulfill the mission of the Refuge System. Second, Sunkhaze Meadows NWR and Carlton Pond WPA need up-to-date plans that establish priorities and ensure consistent management. Third, the refuge was administratively consolidated in 2005 to increase management efficiencies. Currently, Sunkhaze Meadows NWR and the Carlton Pond WPA are administered by the staff at the Maine Coastal Islands National Wildlife Refuge Complex in Rockland, Maine.

Lastly, several Service policies providing specific guidance on implementing the Refuge Improvement Act have been developed since the refuge and WPA were established. A CCP incorporates these policies, and develops strategic management direction for 15 years, by:

- Stating clearly the desired future conditions for refuge habitat, wildlife, visitor services, staffing, and facilities.
- Explaining concisely to state agencies, refuge neighbors, visitors, partners, and other stakeholders the reasons for management actions.
- Ensuring that refuge management conforms to the policies and goals of the Refuge System and legal mandates.
- Ensuring that present and future public uses are appropriate and compatible.
- Providing long-term continuity and consistency in management direction.
- Justifying budget requests for staffing, operating and maintenance funds.

Project Area

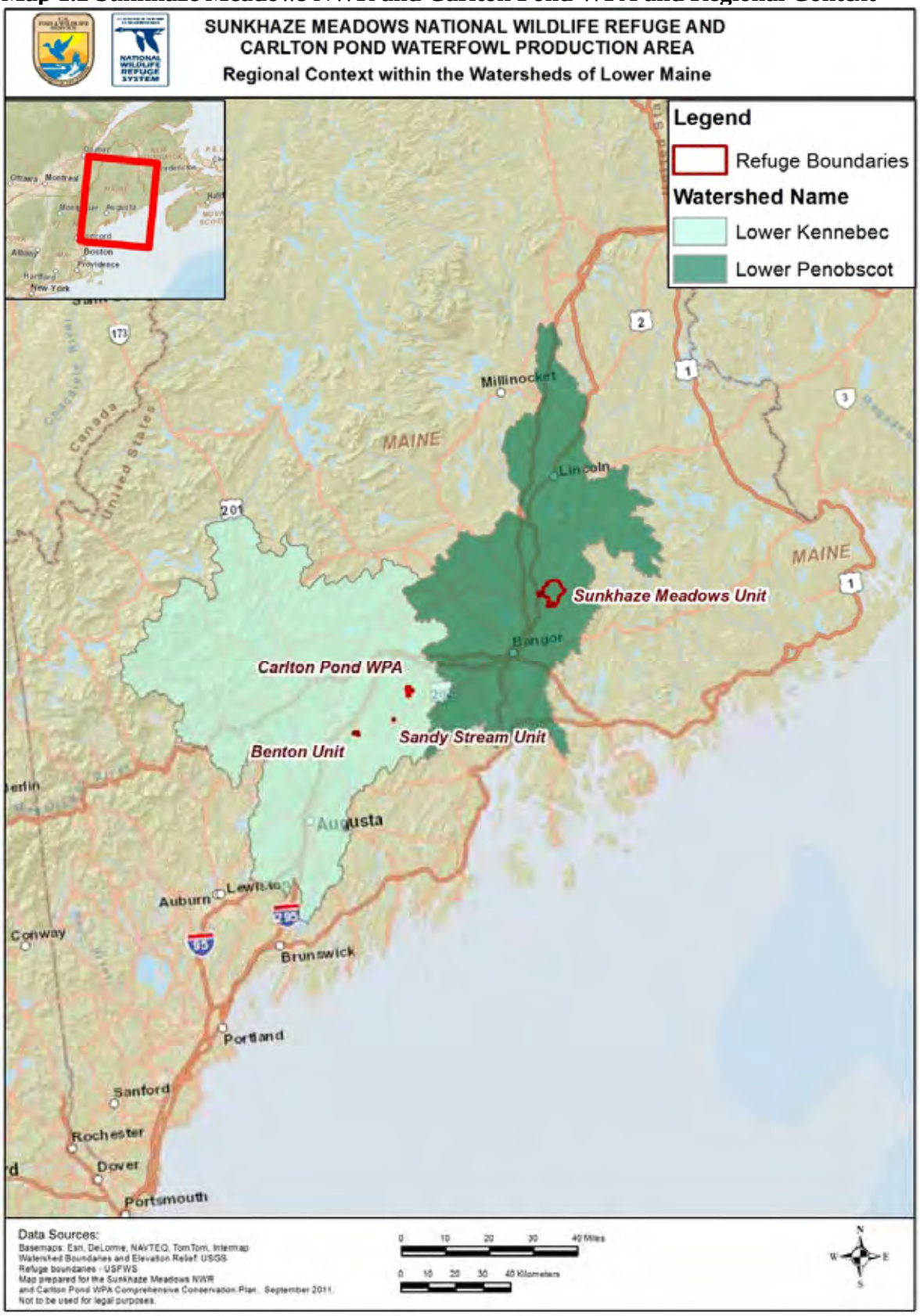
Sunkhaze Meadows NWR, Carlton Pond WPA, and the four associated FmHA conservation easements lie within two large watersheds: the Lower Penobscot River and Kennebec River watersheds (map 1.1). The Sunkhaze Meadows Unit in Milford, Maine, encompasses 11,484 acres. Sunkhaze Stream, which flows through the Sunkhaze Meadows Unit, drains directly into the Penobscot River. This portion of the refuge protects the second largest and one of the most remarkable peatlands in Maine. Although Sunkhaze Meadows NWR is a small part of the total conserved lands throughout the State of Maine, these lands protect important parts of the regional landscapes in which they are located. Adding significantly to the conserved lands network around the Sunkhaze Meadows Unit is the Lower Penobscot Forest Project, a collaboration of The Nature Conservancy (TNC) and the Forest Society of Maine (see lands adjacent to Sunkhaze Meadows Unit in map 1.3). Together they are working to conserve over 42,000 acres abutting the southeast boundary of the refuge.

Carlton Pond WPA, as well as the refuge's Benton and Sandy Stream Units, lie within the Lower Kennebec River watershed (map 1.2). These sites drain toward the Sebasticook River that in turn flows into the Kennebec River. The Penobscot and Kennebec Rivers are subcomponents of the Gulf of Maine watershed, an immense area extending from eastern Quebec to Cape Cod, Massachusetts. Maine is the only state located entirely within the watershed boundary (see map 1.1). The Gulf of Maine watershed encompasses the great rivers of Maine: St. John, Penobscot, Kennebec, Androscoggin, Saco, and the coastal drainages of Downeast Maine. It also provides habitat for more than a dozen State-listed threatened or endangered species.

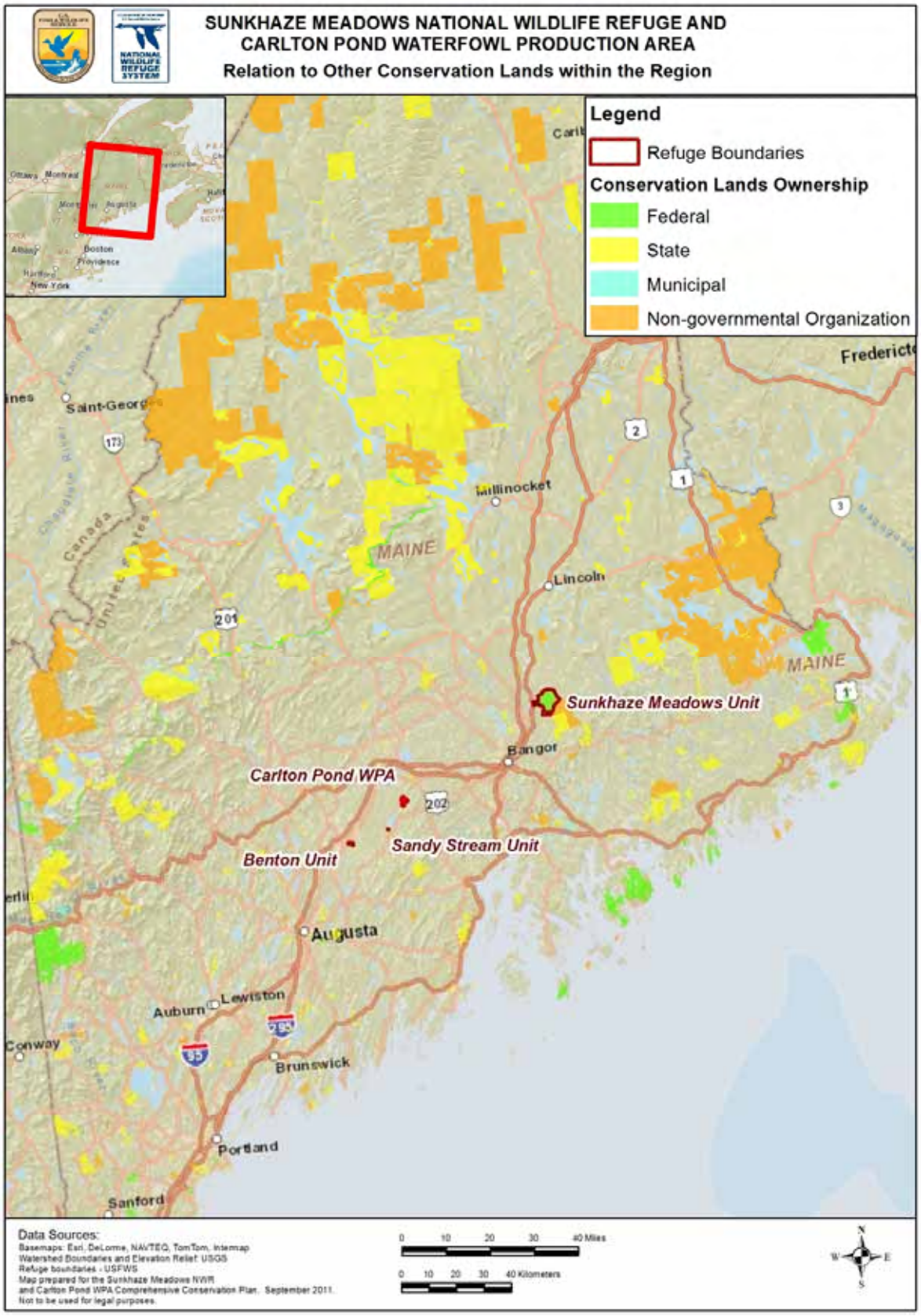
Sunkhaze Meadows NWR also has responsibility for four conservation easements on private lands in Maine, totaling about 320 acres. One easement (54 acres) is located in the Penobscot River watershed, about 35 miles north and a little east of Millinocket. Another easement (213 acres) is located in the Penobscot River watershed about 23 miles northwest of Bangor. The remaining two easements are located in the Kennebec River watershed. One easement (about 16 acres) is located about 4 miles northwest of Waterville, the other (37 acres) is located about 26 miles northwest of Waterville.

Map 1.1 Sunkhaze Meadows NWR and Carlton Pond WPA and Context within the Gulf of Maine Watershed

Map 1.2 Sunkhaze Meadows NWR and Carlton Pond WPA and Regional Context



Map 1.3 Refuge Location and Relation to Regional Conservation Lands



Service and Refuge System: Policies and Mandates Guiding Planning

The U.S. Fish and Wildlife Service and its Mission

As part of the Department of the Interior, the Service administers the Refuge System. The Service mission is "Working with others, to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

Congress entrusts the Service with the conservation and protection of these Federal trust resources: migratory birds and fish, federally listed threatened or endangered species, interjurisdictional fish, wetlands, certain marine mammals, and national wildlife refuges. The Service also enforces Federal wildlife laws and international treaties on importing and exporting wildlife, assists states with their fish and wildlife programs, and helps other countries develop conservation programs.

The Service Manual (USFWS 2011) contains the standing and continuing directives on implementing our authorities, responsibilities, and activities. In addition, the Service publishes special directives that affect the rights of citizens or the authorities of other agencies separately in the Code of Federal Regulations (CFR); the Service Manual does not duplicate them (see 50 CFR 1–99).

The National Wildlife Refuge System and its Mission and Policies

The Refuge System is the world's largest network of lands and waters set aside specifically for the conservation of wildlife and the protection of ecosystems. More than 550 national wildlife refuges encompass more than 150 million acres of lands and waters in all 50 states and several island territories. Each year, more than 40 million visitors hunt, fish, observe and photograph wildlife, or participate in environmental education and interpretation on refuges (Carver and Caudill 2007).

In 1997, President Clinton signed the Refuge Improvement Act into law. This act establishes a unifying mission for the Refuge System and a new process for determining the compatibility of public uses on refuges, and requires us to prepare a CCP for each refuge. The mission of the Refuge System, as established by the Refuge Improvement Act, focuses on wildlife conservation first. The Refuge Improvement Act also established that the mission of the Refuge System, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction on each refuge. The mission of the Refuge System 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." (National Wildlife Refuge System Improvement Act; P.L. 105–57)

The National Wildlife Refuge System Manual (Refuge Manual) contains policy governing the operation and management of the Refuge System that the Service Manual does not cover, including technical information on implementing refuge policies and guidelines on enforcing

laws (USFWS 2010). We have summarized a few noteworthy policies instrumental in developing this draft CCP and EA in the next section.

Policy on the National Wildlife Refuge System Mission, Goals, and Purposes

This policy (601 FW 1) sets forth the Refuge System mission noted above, how it relates to the Service mission, and explains the relationship of the Refuge System mission and goals, and the purpose(s) of each unit in the Refuge System. In addition, it identifies the following Refuge System goals:

- Conserve a diversity of fish, wildlife, and plants.
- Develop and maintain a network of habitats.
- Conserve those ecosystems, plant communities, and wetlands that are unique within the United States.
- Provide and enhance opportunities to participate in compatible, wildlife-dependent recreation.
- Help to foster public understanding and appreciation of the diversity of fish, wildlife, and plants and their habitats.

This policy also establishes management priorities for the Refuge System:

- Conserve fish, wildlife, and plants and their habitats.
- Facilitate compatible, wildlife-dependent recreational uses.
- Consider other appropriate and compatible uses.

Policy on Refuge System Planning

This policy (602 FW 1, 2, 3) establishes the requirements and guidance for Refuge System planning, including CCP and step-down management plans. It states that the Service will manage all refuges in accordance with an approved CCP that, when implemented, will help:

- Achieve refuge purposes.
- Fulfill the Refuge System mission.
- Maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System.
- Achieve the goals of the National Wilderness Preservation System and the National Wild and Scenic Rivers System.
- Conform to other applicable laws, mandates, and policies.

That planning policy provides step-by-step directions and identifies the minimum requirements for developing all CCP's. Among them, the Service is to review any existing special designation areas such as Wilderness and Wild and Scenic Rivers, specifically address the potential for any new special designations, conduct a Wilderness review, and incorporate a summary of that review into each CCP (602 FW 3).

Policy on the Appropriateness of Refuge Uses

Federal law and Service policy provide the direction and planning framework for protecting the Refuge System from inappropriate, incompatible, or harmful human activities and ensuring that visitors can enjoy its lands and waters. This policy (603 FW 1) provides a national framework for determining appropriate refuge uses to prevent or eliminate uses that should not occur on Refuge System lands or waters. It describes the initial decision process the refuge manager must

follow when first considering whether to allow a proposed use on a refuge. An appropriate use must meet at least one of the following four conditions:

- The use is a wildlife-dependent recreational use as identified in the Improvement Act.
- The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act became law.
- The use follows State regulations for the take of fish and wildlife.
- The use has been found to be appropriate after concluding a specified findings process using 10 criteria.

Commercial uses are subject to additional conditions before they can be found appropriate (see 50 CFR 29.1). Draft findings of appropriateness for Sunkhaze Meadows NWR and Carlton Pond WPA are provided in appendix B.

Policy on Compatibility

This policy (603 FW 2) complements the appropriateness policy. After finding a use is appropriate, the refuge manager must conduct an assessment to determine compatibility. The compatibility determination ensures refuge uses are consistent with refuge purposes and the mission of the Refuge System. Draft compatibility determinations completed for those public uses found to be appropriate are included in appendix B as part of this draft CCP and EA.

Service policy on compatibility determinations (603 FW 2) provides guidelines for determining compatibility of uses and procedures for documentation and periodic review of existing uses. Highlights of the guidance in that chapter are as follows:

- The Refuge Improvement Act and its regulations require an affirmative finding by the refuge manager on the compatibility of a public use before the Service allows it on a refuge.
- A compatible use is one “that will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge.”
- The act defines six wildlife-dependent uses that are to receive enhanced consideration on refuges: “hunting, fishing, wildlife observation and photography, and environmental education and interpretation.”
- The refuge manager may authorize those priority uses on a refuge when they are compatible and consistent with public safety.
- When the refuge manager publishes a compatibility determination, it will stipulate the required maximum reevaluation dates: 15 years for wildlife-dependent recreational uses; or 10 years for other uses.
- However, the refuge manager may reevaluate the compatibility of a use at any time. For example, the refuge manager may reevaluate compatibility sooner than its mandatory date, or even before the Service completes the CCP process, if new information reveals unacceptable impacts or incompatibility with refuge purposes (603 FW 2.11, 2.12).
- The refuge manager may allow or deny any use, even one that is compatible, based on other considerations such as public safety, policy, or available funding.

Draft compatibility determinations for Sunkhaze Meadows NWR and Carlton Pond WPA are provided in appendix B.

Policy on Wildlife-dependent Public Uses

Part 605, chapter 1 of the Service manual presents specific guidance on implementing management of the priority public uses, including the following criteria for providing a quality, wildlife-dependent recreation program that:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflict with fish and wildlife population or habitat goals or objectives in an approved plan.
- Minimizes or eliminates conflicts with other compatible, wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and our role in managing and conserving these resources.
- Provides reliable and reasonable opportunities to experience wildlife.
- Uses facilities that are accessible to people and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Policy on Maintaining Biological Integrity, Diversity, and Environmental Health

This policy (601 FW 3) provides guidance on maintaining or restoring the biological integrity, diversity, and environmental health of the Refuge System, including the protection of a broad spectrum of fish, wildlife, and habitat resources in refuge ecosystems. It provides refuge managers with a process for evaluating the best management direction to prevent the additional degradation of environmental conditions and restore lost or severely degraded components of the environment. It also provides guidelines for dealing with external threats to the biological integrity, diversity, and environmental health of a refuge and its ecosystem.

Native American Policy

The Service adopted a Native American Policy in 1994. This policy is a framework for our relationships with Native American Tribes in order to address whole ecosystems in conservation, and do it with the greatest assistance possible. You may view this policy on the Web at *www.fws.gov/policy/npi94_10.html*; accessed September 2012.

Some highlights of the Native American Policy of the U.S. Fish and Wildlife Service include:

- The Service recognizes the sovereign status of Native American governments.
- There is a unique and distinctive political relationship between the United States and Native American governments…that differentiates Native American governments from other interests and constituencies.
- The Service will maintain government-to-government relationships with Native American governments.
- Affected Native American governments will be afforded opportunities to participate in the Service's decisionmaking process for Service lands.
- The Service will consult with Native American governments on fish and wildlife resource matters of mutual interest and concern to the extent allowed by the law. The goal is to

keep Native American governments involved in such matters from initiation to completion of related Service activities.

- The Service will involve Native American governments in all Service actions that may affect their cultural or religious interests, including archaeological sites.
- The Service will provide Native Americans reasonable access to Service managed or controlled lands and waters for exercising ceremonial, medicinal, and traditional activities recognized by the Service and by Native American governments.
- The Service will provide Native American governments with the same access to fish and wildlife resource training programs as provided to other government agencies.
- The Service will facilitate the development of Native American fish and wildlife professionals through innovative educational programs and on-the-job training, partnerships and cooperative relationships with Native American educational institutions, and including Native American schools in its environmental education outreach programs.

Other Mandates

Although Service and Refuge System policy and the purpose(s) of each refuge provide the foundation for its management, other Federal laws (e.g., Migratory Bird Treaty Act, Archaeological Resources Protection Act, The Historic Sites, Buildings and Antiquities Act, National Historic Preservation Act), executive orders, treaties, interstate compacts, and regulations on conserving and protecting natural and cultural resources also affect how the Service manages refuges. The "Digest of Federal Resource Laws of Interest to the U.S. Fish and Wildlife Service" describes many of them at *http://www.fws.gov/laws/lawsdigest.htm*.

Of particular note for Sunkhaze Meadows NWR, are The Wilderness Act of 1964 (16 U.S.C. 1131–1136; P.L. 88–577) and The Wild and Scenic Rivers Act of 1968, as amended.

<u>The Wilderness Act</u>

The Wilderness Act establishes a National Wilderness Preservation System (NWPS) that is composed of federally owned areas designated by Congress as Wilderness areas. The act directs each agency administering designated Wilderness to preserve the wilderness character of areas within the NWPS, and to administer the NWPS for the use and enjoyment of the American people in a way that will leave those areas unimpaired for future use and enjoyment as wilderness. The act also directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island (regardless of size) within the Refuge System and the National Park System for inclusion in the National Wilderness Preservation System. Service planning policy requires that the Service evaluate the potential for wilderness on refuge lands, as appropriate, during the CCP planning process. The draft Wilderness Review is available in this document as appendix C.

<u>The Wild and Scenic Rivers Act</u>

The Wild and Scenic Rivers Act of 1968, as amended, selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, preserves them in a free flowing condition, and protects their local environments. Service planning policy requires that the Service evaluate the potential for wild and scenic rivers designation on refuge lands, as appropriate, during the CCP planning process.

Chapter 4, "Environmental Consequences," evaluates this plan's compliance with the acts noted above, and with the Clean Water Act of 1977 as amended (33 U.S.C. 1251, et seq.; P.L. 107–303), the Clean Air Act of 1970 as amended (42 U.S.C. 7401 et seq.), and the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531–1544), as amended. Finally, the Service designed this draft CCP and EA to comply with NEPA and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500–1508). The draft Wild and Scenic Rivers Review is available as appendix D.

History and Establishing Purposes

Refuges and WPA can be established by U.S. Congress through special legislation, by the President through Executive Order, or administratively by the Director of the Service (with authority delegated by the Secretary of the Interior). Refuge lands may be acquired under a variety of administrative and legislative authorities as well.

Sunkhaze Meadows NWR

In the early 1980s, the peat mining industry was exploring the potential to mine peat from Sunkhaze Meadows Unit for use as heating fuel, threatening the bog and the integrity of the wetland complex. The mining plans were not implemented and because of the heightened awareness of the ecological significance of the area, funding was secured for its permanent protection as a national wildlife refuge.

Sunkhaze Meadows NWR was established administratively in 1988 to ensure the ecological integrity of the Sunkhaze Meadows Unit peat bog and to conserve wetland, stream, and forest habitats, and associated wildlife. The Sunkhaze Meadows NWR also includes two smaller units, Benton (334 acres) and Sandy Stream (58 acres), and four conservation easements scattered throughout central Maine.

Sunkhaze Meadows NWR was established under the authority of the Fish and Wildlife Act of 1956 and the Refuge Recreation Act. The purposes for which Sunkhaze Meadows NWR was established are:

- "...for the development, advancement, management, conservation, and protection of fish and wildlife resources...." 16 U.S.C. 742f(a)(4) (Fish and Wildlife Act of 1956)
- "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services." 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)
- "...suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...." 16 U.S.C. 460k-1 (Refuge Recreation Act, as amended)

Carlton Pond WPA

Carlton Pond WPA was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965, under the authority of the Migratory Bird Conservation Act and Migratory Bird Hunting and Conservation Stamp Act. The intent was to provide primarily breeding habitat for waterfowl, as well as benefitting shorebirds, waterbirds, and other wildlife. About 95 percent of the nation's waterfowl

production areas occur in the prairie potholes region of the Midwest (USFWS 2007). Carton Pond WPA is the only waterfowl production area in the Service's Northeast Region. The 1,068-acre Carlton Pond WPA was managed by Moosehorn NWR until Sunkhaze Meadows NWR was established in 1988.

The purposes for which Carlton Pond WPA was established are:

- "...as Waterfowl Production Areas subject to… all of the provisions of such Act [Migratory Bird Conservation Act] ...except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "...for any other management purpose, for migratory birds." 16 U.S.C. 715(d) (Migratory Bird Conservation Act)

Farmers Home Administration Conservation Easements

From the late 1980s to the mid-1990s, the Farmers Home Administration (FmHA) acquired many properties throughout the country through foreclosure sales. Under the terms of a memorandum of understanding between FmHA and the Service, a review team consisting of their staff, our staff, staff from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, and staff from USDA Agricultural Stabilization and Conservation Service evaluated those properties for their conservation value. Based on those evaluations, and before reselling the properties, the FmHA placed permanent conservation easements on many of these properties to protect important habitats, as authorized by the Food, Agriculture, Conservation, and Trade Act of 1990. FmHA retained full ownership in a smaller number of the properties. The responsibility for monitoring and enforcing those easements and managing the retained properties rests was transferred to the Service under authority of the Consolidated Farm and Rural Development Act (7 U.S.C. 2002). We have usually delegated this authority to the manager of the closest refuge. As discussed previously under "Project Area," Sunkhaze Meadows NWR has responsibility for four conservation easements on private lands in Maine, totaling about 320 acres. The Service's rights and responsibilities are specific to conditions stipulated in each easement.

The Farmers Home Administration properties (Benton and Sandy Stream Units) and conservation easements were transferred "...for conservation purposes..." 7 U.S.C. 2002 (Consolidated Farm and Rural Development Act).

Conservation Plans and Initiatives Guiding the Proposed Action

Important guidance for habitat management and visitor service management at Sunkhaze Meadows NWR and Carlton Pond WPA has already been provided by a series of refuge-specific, State, regional, and national plans and initiatives, and their priorities.

Regional and National Plans and Initiatives

Refuge System Visioning: Fulfilling the Promise, Conserving the Future
In 1999, the report, "Fulfilling the Promise, The National Wildlife Refuge System; Visions for Wildlife, Habitat, People and Leadership" (USFWS 1999a), culminated a year-long process by teams of Service employees that created a nationwide vision for the Refuge System.

To update the vision for the Service's future, the *Conserving the Future* conference was convened in July 2011 for the purpose of working toward a renewed and updated vision for the Refuge System. It was the largest gathering regarding the future of the Refuge System since the *Fulfilling the Promise* conference in 1998. It began with a draft vision document and over the course of the conference, both online and in-person feedback was gathered for its revision and finalization. The final vision document and its recommendations were published in the fall of 2011 (USFWS 2011a). This 21st century strategic vision for the Refuge System acknowledges the broad social, political, and economic changes that have made habitat conservation more challenging since the agency last set comprehensive goals in 1999. The vision document represents the Service's vision for how to protect and conserve lands and waters in the coming decades and outlines a series of 24 recommendations for Service staff and other conservation partners to consider in future management.

We have often looked to the recommendations in these documents for guidance when writing this draft CCP and EA. For example, one recommendation is that we "ensure these plans view refuges in a landscape context and describe actions to project conservation benefits beyond refuge boundaries." To address this, we have viewed the refuge and WPA within a wider landscape context throughout this document and have targeted conservation actions that directly relate to needs within the larger landscape. Another recommendation of the vision document involves partnerships, "develop and nurture active and vibrant Friends groups or community partnerships for every staffed refuge or refuge complex." Throughout this CCP, we have recognized the value that the Friends and other partnerships bring to the refuge and WPA and our reliance on them for its future. The vision document also outlines other recommendations for the Service, including other programs outside of the Refuge System. Many of these other recommendations are supported in part by refuge management guided by this CCP.

Strategic Habitat Conservation
The Service has a goal of establishing and building capacity for science-driven landscape conservation on a continental scale. Our approach, known as strategic habitat conservation, applies adaptive resource management principles to the entire range of species, groups of species, and natural communities of vegetation and wildlife. This approach is founded on an adaptive, iterative process of biological planning, conservation design, conservation delivery, and monitoring and research. The Service is refining this approach to conservation in a national geographic framework. This geographic frame of reference will allow us to more precisely explain to partners, Congress, and the American public why, where, and how we target resources for landscape-scale conservation and how our efforts connect to a greater whole. More information regarding SHC can be found at *http://www.fws.gov/science/StrategicHabitatConservation.html*.

North Atlantic Landscape Conservation Cooperative Operations Plan (USFWS 2010)
The Service and our partners are implementing a network of Landscape Conservation Cooperatives (LCCs) to help protect our nation's natural and cultural resources and landscapes from negative effect of land use changes, drought, wildfire, habitat fragmentation, contaminants, pollution, invasive species, disease, and a rapidly changing climate. LCCs are public-private partnerships that recognize these challenges transcend political and jurisdictional boundaries and require a more networked approach to conservation that is collaborative, adaptive, and grounded in science to ensure the sustainability of America's land, water, wildlife, and cultural resources. The North Atlantic LCC is a conservation science-management partnership, consisting of federal agencies, states, Tribes, universities and private organizations, focused on collaboratively developing science-based recommendations and decision-support tools to implement on-the-ground conservation. The goal is having all partners working together to sustain landscapes capable of maintaining abundant, diverse and healthy populations of fish, wildlife, and plants. The work of the North Atlantic LCC will be integrated with a U.S. Geological Survey (USGS) regional climate impact response center to conduct studies and develop landscape-scale conservation plans. The North Atlantic LCC will also address impacts to ecosystems beyond those of climate change, such as potential extirpation of wildlife populations from disease or habitat loss.

LCCs use principles of strategic habitat conservation to develop and communicate landscape-scale scientific information to shape conservation across the Northeastern United States. This initial plan outlines the regional threats to conservation, some priority species and habitats, as well as active regional partnerships.

North American Bird Conservation Initiative (NABCI)
The NABCI brings together the individual landbird, shorebird, waterbird, and waterfowl plans into a coordinated effort to protect and restore all native bird populations and their habitats in North America. By integrating bird conservation partnerships, NABCI strives to reduce redundancy in the structure, planning, and implementation of conservation projects. It utilizes Bird Conservation Regions (BCRs) to guide landscape-scale, science-based approaches to conserving birds and their habitats.

Sunkhaze Meadows NWR lies within BCR 14, the Atlantic Northern Forest. A blueprint for the design and delivery of bird conservation in this region was created by the Service based on input from dozens of bird experts from around the region (Dettmers 2006). The BCR 14 blueprint identifies 52 bird species designated "highest" or "high" conservation priority in the region, and 15 habitat types important for supporting one or more of those priority bird species during at least one of their life stages. Those habitats either need critical conservation attention, or are crucial in long-term planning to conserve continentally and regionally important bird populations. Of the 52 highest and high-priority birds, 17 breed on the Sunkhaze Meadows NWR or Carlton Pond WPA and several others migrate through.

Each of the individual bird plans noted below were referenced as we developed habitat goals and objectives for the Sunkhaze Meadows NWR and Carlton Pond WPA.

- Partners In Flight Landbird Conservation Plan: Physiographic Area 27: Northern New England (Hodgman and Rosenberg 2000)

- Partners In Flight Landbird Conservation Plan: Physiographic Area 28: Eastern Spruce-Hardwood Forest (Rosenberg and Hodgman 2000)
- Northern Atlantic Regional Shorebird Plan Version 1.0. (Clark and Niles 2000)
- Regional Waterbird Conservation: Mid Atlantic/New England/Maritimes (MANEM Waterbird Working Group 2006)
- Atlantic Coast Joint Venture Waterfowl Implementation Plan (ACJV 2005)

Partners in Flight Area 27 Landbird Conservation Plan (Rosenberg and Hodgman 2000)
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 population declines of bird species and "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 areas as planning units. Sunkhaze Meadows NWR and Carlton Pond WPA straddle the PIF physiographic areas 27, Northern New England and 28, Eastern Spruce-Hardwood Forest.

The PIF 27 (Northern New England) plan includes objectives for the following habitat types and associated species of conservation concern on the refuge.

Northern hardwood forest:	Canada warbler, wood thrush, black-throated blue warbler, and blackburnian warbler
Early successional forest:	American woodcock and chestnut-sided warbler

Partners in Flight Area 28 Landbird Conservation Plan (Rosenberg and Hodgman 2000)
The PIF 28 (Eastern Spruce-Hardwood Forest) plan (Rosenberg and Hodgman 2000) includes objectives for the following habitat types and associated species of conservation concern on the refuge.

Northern hardwood forest:	Canada warbler, wood thrush, and veery
Conifer (spruce-fir) forest:	bay-breasted warbler, Cape May warbler, blackburnian warbler, spruce grouse, and red crossbill
Boreal peatland/edge/shrub:	American woodcock, chestnut-sided warbler, and olive-sided flycatcher

North American Waterbird Conservation Plan (Kushlan et al. 2002)
The North American Waterbird Conservation Plan (NAWCP) represents an independent partnership among individuals and institutions with interest and responsibility for conserving waterbirds and their habitats. The primary goal of the plan is to ensure that the distribution, diversity, and abundance of populations and habitats of breeding, migratory, and non-breeding waterbirds are sustained or restored throughout the lands and waters of North America, Central America, and the Caribbean. The plan facilitates continentwide planning and monitoring, national-state-provincial conservation action, regional coordination, and local habitat protection and management.

A partnership of organizations and individuals working to facilitate waterbird conservation in the Mid-Atlantic/New England/Maritimes (MANEM) region of the U.S. and Canada has developed a regional waterbird conservation plan (MANEM Waterbird Working Group 2006). Over 200 partners comprising the MANEM Waterbird Working Group have compiled and interpreted

technical information on the region's waterbird populations and habitats, assessed conservation status of these natural resources, developed strategies to ensure the persistence of sustainable waterbird populations in the region, and identified near-term priorities.

Seventy-four waterbird species use habitats in MANEM for breeding, migrating, and wintering. Avian families include loons, grebes, shearwaters, storm-petrels, boobies, pelicans, cormorants, herons, ibises, rails, gulls, terns, skuas, jaegers and alcids. Partners in four subregions of MANEM selected 43 Focal Species for immediate conservation action. In addition, 55 of MANEM's waterbirds are identified in state wildlife action plans as Species of Greatest Conservation Need (MANEM Waterbird Working Group 2006).

USFWS Migratory Bird Program Strategic Plan (USFWS 2004)

The Migratory Bird Program Strategic Plan provides direction for the Services' migratory bird management over the next decade (2004 to 2014). The plan contains a vision and recommendations for the Refuge System's place in bird conservation. It defines strategies for the Service, including the refuge system, to actively support bird conservation through monitoring, conservation, consultation, and recreation. To the extent practicable, considerations for standard monitoring protocols, habitat assessment and management, and promoting nature-based recreation and education to forward the vision of the Migratory Bird Program Strategic Plan have been incorporated into this plan.

USFWS Birds of Conservation Concern (USFWS 2008)

The 1988 amendment to the Fish and Wildlife Conservation Act mandated that the Service "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973."

This report identifies the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the Service's highest conservation priorities and draws attention to species in need of conservation action. The geographic scope includes the United States in its entirety, including island territories in the Pacific and Caribbean. Birds considered within this report include nongame birds, gamebirds without hunting seasons, subsistence-hunted nongame birds in Alaska; and Endangered Species Act candidate, proposed endangered or threatened, and recently delisted species. Assessment scores are based on several factors, including population trends, threats, and distribution, abundance, and area importance.

Maine Comprehensive Wildlife Conservation Strategy (MDIFW 2005)

Maine's comprehensive wildlife conservation strategy (MDIFW 2005) targets species in greatest need of conservation for the State while keeping "common species common." The plan covers the entire State, from the coastline to the heights of Mt. Katahdin. It builds on existing fish and wildlife programs and on a species planning effort that has been ongoing for nearly 40 years and a landscape approach to habitat conservation that was initiated in 2000. These efforts incorporate a long history of public involvement and collaboration among conservation partners. The Maine landscape is not static but the result of profound natural and human-caused changes. Changes brought about by fire, land conversion, abandonment of agricultural land, timber harvesting, and

the defoliation of forest by insects have had, and will continue to have, a dramatic impact on habitats and levels of biodiversity. Similarly, aquatic ecosystems in Maine have been profoundly and adversely affected by exotic introductions, dam building, pollution, pesticide use, and excessive nutrient input. These effects have occurred, and are occurring, statewide, but they differ in intensity from north to south.

In their statewide wildlife conservation plan, the Maine Department of Inland Fisheries and Wildlife (MDIFW) noted the following: "Historically, wildlife conservation efforts tended to focus on single species. Other conservation efforts identify and protect areas of land (focus areas) that contain diverse assemblages of at-risk species. However, as we continue to change our landscape, species-by-species and focus-area conservation approaches, while both laudable may not be the most effective means to conserve biodiversity, and they do little to ensure the continued well-being of more common species under Department stewardship. Landscape-level conservation that addresses the needs of many species by conserving underlying resources upon which they depend, may be a more productive way to use limited resources to benefit the greatest number of species and address the full array of wildlife in Maine."

<u>USFWS Fisheries Program, Northeast Region Strategic Plan 2009 to 2013 (USFWS 2009)</u>
The primary mission of the Service's Fisheries Program is to work with others to maintain self-sustaining, healthy populations of coastal and diadromous fish (fish that spend part of their lives in fresh water and part in the ocean), fish species that cross state or national boundaries, and endangered aquatic animals and their habitats. In the Northeast Region, 25 fishery management offices and national fish hatcheries work with states and other partners to restore and protect a variety of fish and other aquatic species.

The Regional Fisheries Program Strategic Plan (USFWS 2009) is an extension of the vision, describing more specifically the tactics to be implemented by the Northeast Region to fulfill the goals and objectives identified in the vision. The first plan covered years 2004 to 2008. One step-down effort resulting from the plan is the identification and ranking of fish and other aquatic species according to their level of conservation concern by USGS hydrologic unit (i.e. HUC watersheds). We used this ranking and have consulted with the Regional Fisheries Program staff in developing aquatic objectives and strategies.

<u>Eastern Brook Trout Joint Venture Conservation Strategies (EBJV 2011)</u>
The Joint Venture's Conservation Strategy is directed by rangewide objectives to guide conservation efforts across the eastern range of brook trout. The regional objectives represent expectations to be achieved by 2012. The Joint Venture, working with the National Fish Habitat Partnership, will use the Conservation Strategy (EBJV 2011) as its blueprint for raising and using resources at the state level. The Eastern Brook Trout Joint Venture Conservation Strategies (EBJV 2011) for Maine were developed to maintain and restore then native brook trout populations in the streams, rivers, lakes, and ponds of Maine. Short- and long-term goals of the Joint Venture include determining the status of wild brook trout in watersheds lacking adequate and current data, identifying degraded stream habitats and prioritizing restoration efforts, restore degraded brook trout habitat, and prevent further degradation of existing brook trout habitat.

Sebasticook Regional Land Trust's Unity Wetlands Conservation Plan (FUW 2006)
The Sebasticook Regional Land Trust (formerly the Friends of Unity Wetlands) developed the Unity Wetlands Conservation Plan (FUW 2006) with support from The Nature Conservancy (TNC) and The Natural Resource Conservation Service. The plan encompasses the 42,000-acre Unity Wetlands Focus Area, a unique and significant resource, with a combination of wild and working lands that is rich in biodiversity, scenic beauty, and economic value. This large tract of relatively undeveloped land stretches from the west side of Unity through all of Unity Plantation and into portions of Albion, Benton, Burnham, Clinton, and Freedom. It is home to many threatened and rare plants, animals, and natural communities, as well as to more wide-ranging creatures like black bear, moose, and bobcat. It is home, too, to a rich agricultural heritage that is critical to the regional economy. The farms and infrastructure within and adjacent to the Unity Wetlands are a vital component in Maine's Dairy Belt. They also provide habitat in their own right for fish and wildlife, contribute to several blocks of contiguous undeveloped habitat, and are a buffer between the interior undeveloped blocks and encroaching development.

The Benton and Sandy Stream Units are located within the Unity Wetlands Focus Area. Recommendations in the conservation plan support refuge management objectives of increasing the riparian buffer at Sandy Stream and managing habitat for grassland birds at Benton. The Sebasticook Regional Land Trust is interested in partnering with the refuge to increase public understanding of refuge lands, their conservation values and public use opportunities. Carlton Pond WPA is located north and east of Unity Pond, just outside of the Unity Wetlands Focus Area.

Refuge-specific Plans

A number of other refuge-specific plans have been consulted either in their draft or final format to help guide decisionmaking. These plans will also be maintained and updated as necessary to maintain accordance with the recommendations of the CCP.

Sunkhaze Meadows NWR Station Management Plan (USFWS 1992)
The original master plan for the refuge was developed in 1992 through collaboration amongst individuals within the Northeast Region of USFWS's Division of Refuges. The master plan set the original guidance for management of Sunkhaze Meadows NWR and outlined the resources it protected.

Visitor Service Review
A Service-based review team assessed the public use issues, opportunities, and facilities available at Sunkhaze Meadows NWR in preparation for the refuge's comprehensive conservation planning process and to develop recommendations to improve the quality of the refuge's visitor services program. A visitor services review was conducted for Sunkhaze Meadows NWR on October 18 to 22, 2010, by a review team consisting of visitor services personnel from the Regional Office and other refuges. This review focused on the Sunkhaze Meadows Unit of the refuge, and recommendations included increased staffing, visitor use access, and public outreach. The Visitor Services Review recommendations were used as a stepping-off point for visitor services planning; its recommendations were also used to help develop goals, objectives, and strategies for refuge visitor services planning.

Step-down Plans

The Service Manual, (602 FW 4) identifies more than 25 step-down management plans that may be completed for each refuge. These plans provide the details necessary to "step-down" general goals and objectives to specific strategies and implementation schedules. Some require annual revisions; others are revised on a 5- to 10-year schedule. Some require additional NEPA analysis, public involvement, and compatibility determinations before they can be implemented. Following is a list of step-down plans for the refuge and WPA:

- Annual Habitat Work Plan, most recently completed in 2010.
- Fire Management Plan, completed in 2001.
- Furbearer Management Plan, completed in 2001.
- Fisheries Management Plan, completed in 1999, to be updated after approval of the final CCP.
- Wildlife Inventory Management Plan, completed in 1995.
- Hunting Management Plan, completed in 1990, to be updated after approval of the final CCP.
- Law Enforcement Plan, to be completed after approval of the final CCP.
- Visitor Services Plan, to be completed after approval of the final CCP.
- Safety Plan, to be completed after approval of the final CCP.

Refuge and WPA Vision

The planning team developed the following vision statement to provide a guiding philosophy and sense of purpose in the CCP.

> *Sunkhaze Meadows NWR and Carlton Pond WPA are a tapestry of natural lands within central Maine.*
>
> *The Sunkhaze Meadows Unit supports an expansive, intact peat bog system. The free-flowing Sunkhaze Stream and its tributaries meander through diverse habitats including raised peat domes, grassy wet meadows, and floodplain forests before joining the restored Penobscot River. Mature upland forests surround the wetlands, protecting this unspoiled landscape for future generations of plants, animals, and people.*
>
> *Bobolink and sedge wren sing and woodcock dance in the large contiguous grassland and deer overwinter in the forest mosaic comprising the Benton Unit. Wood turtles and rare mussels are protected by the wide, shaded riparian forests of the Sandy Stream Unit.*
>
> *Carlton Pond WPA is a beautiful wetland jewel amidst a pastoral landscape. Rare black terns nest in the emergent marsh, while bald eagles, bitterns, and marsh wrens forage amid the shallow open waters and emergent pickerelweed and wild rice.*
>
> *Visitors experience wildness and find respite within nature throughout the year. In spring, birders observe migratory waterfowl and songbirds. Wildlife enthusiasts and anglers enjoy fishing, paddling, and hiking throughout summer. Hunters spend crisp autumn mornings stalking their prey. In winter, people snowshoe and ski through the*

silent woods. Through our close partnerships and programs, visitors gain further appreciation of conservation and are inspired stewards of nature.

Refuge and WPA Goals

The planning team developed seven goals after considering the vision statement, the purposes for establishing the refuge and WPA, the missions of the Service and the Refuge System, and the mandates, plans, and conservation initiatives noted above. These goals are intentionally broad, descriptive statements of purpose. They highlight elements that we will emphasize during future management.

Goal 1. Sunkhaze Meadows Biological Management. Promote the environmental health of Sunkhaze Meadows Unit wetland, forest, and aquatic habitats to protect water quality and sustain native rare plants, natural communities, and wildlife, including species of conservation concern.

Goal 2. Carlton Pond WPA Biological Management. Promote the environmental health of forest, open water, and emergent wetland habitat at Carlton Pond WPA to benefit waterfowl and sustain a diversity of wildlife including species of conservation concern.

Goal 3. Benton and Sandy Stream Biological Management. Promote the environmental health of forest, grassland, and shrubland habitat at Benton and Sandy Stream Units to sustain a diversity of wildlife, including species of conservation concern.

Goal 4. Sunkhaze Meadows Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, wildlife, and cultural resources of the Sunkhaze Meadows Unit.

Goal 5. Carlton Pond WPA Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, and wildlife at Carlton Pond WPA.

Goal 6. Benton and Sandy Stream Units Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the shrublands, woods, grasslands, and wildlife at the Benton and Sandy Stream Units.

Goal 7. Partnership Coordination. Communicate and collaborate with local communities, Federal and State agencies, local and Tribal representatives, and other organizations throughout Maine and the region to further the purposes of the refuge and the mission of the National Wildlife Refuge System.

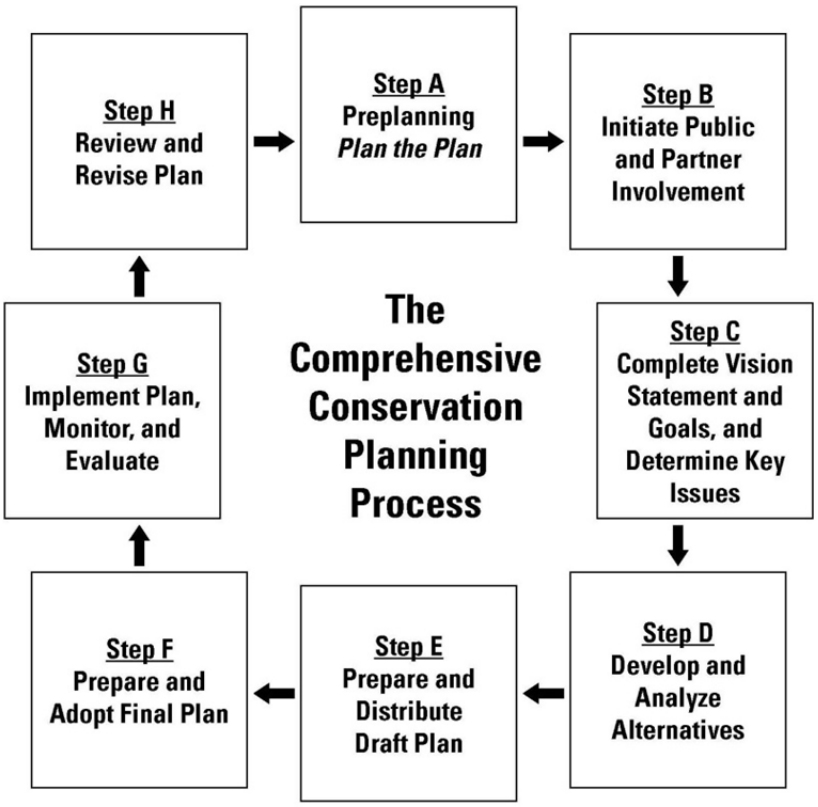
The Comprehensive Conservation Planning Process

Service policy (602 FW 3) establishes an eight-step comprehensive conservation planning process that provides guidelines for developing CCPs and facilitates compliance with NEPA by integrating NEPA compliance requirements in the CCP process (figure 1.1). The full text of the policy and a detailed description of the planning steps can be viewed at *http://policy.fws.gov/602fw3.html*; last accessed September 2012.

The following describes the specific process implemented by the Sunkhaze Meadows NWR and Carlton Pond WPA planning team including how others were engaged in developing issues for the draft CCP.

This summary does not detail the numerous meetings, events, and informal discussions the refuge manager and staff have had since January 2011 where the CCP was a topic of conversation. Those involved a wide range of audiences, including conservation groups, elected officials or their staffs, educators, refuge visitors and other interested individuals. During those discussions, the refuge manager and staff would provide an update on CCP progress and encourage comments and participation.

Figure 1.1 The Service's Comprehensive Conservation Planning Process



Chronological Summary of CCP Process

Step A: Preplanning
Several steps were initiated as part of "Step A: Preplanning" including the formation of the core planning team which is responsible for developing the CCP. Our core planning team consists of refuge staff, Regional Office staff, a representative of the MDIFW, a representative of the Penobscot Indian Nation, an elected representative from the town of Milford, and contractors responsible for compiling information and preparing documents. The CCP planning process began formally on January 4, 2011, with a conference call between refuge staff, Regional Office staff, and contractors to discuss information needs, timelines, and involvement of others in the core planning team. As part of the preplanning process, the core planning team discussed management issues, drafted a vision statement and tentative goals and compiled a project mailing list of known stakeholders, interested individuals, organizations, and agencies. The team also began work on Wilderness and Wild and Scenic River reviews, and began summarizing the refuge's biological inventory and monitoring information.

On March 1, 2011, a conference call was held between refuge staff, regional Service staff, and contractors to work on the preparations for the agency and Tribal partnership scoping meeting, as well as the public scoping meetings.

On March 7, 2011, the refuge manager emailed 29 local, county, State, and Federal agency contacts an invitation to an agency partner scoping meeting. This invitation encouraged agency participation in the agency scoping meeting in order to provide other government entities the opportunity to share their issues and concerns related to Sunkhaze Meadows NWR and Carlton Pond WPA. A follow-up reminder email was sent to this same group of contacts on March 17, 2011.

Step B: Public Scoping
On March 18, 2011, we started "Step B: Initiate Public Involvement and Scoping" by publishing the Notice of Intent (NOI) in the *Federal Register*, officially announcing the beginning of public scoping for the Sunkhaze Meadows NWR and Carlton Pond WPA CCP. The project planning Web site and the refuge Web site were also updated at this time.

On March 23, 2011, the core team contacted approximately 394 individuals and organizations included in the planning contacts database compiled for the CCP. The refuge manager emailed 44 of those contacts inviting them to participate in our scoping process and to attend our public open houses in April and included an electronic copy of the first newsletter. The remaining 350 contacts were mailed paper copies of the first newsletter containing a similar invitation to participate.

On March 24, 2011, the core team held the agency scoping workshop at the Maine Department of Inland Fisheries and Wildlife, Bangor Research Office. The workshop was attended by six representatives from municipal, State, and Federal agencies. Refuge and planning team staff were also in attendance at the meeting.

The core team completed their public scoping meetings in mid-April. Two public scoping meetings were held on April 12, 2011, in Milford, Maine, at the Milford Town Hall: one session was held from 2:00 to 4:00 PM, and another session was held from 6:00 to 8:00 PM. Combined, these meetings were attended by 22 individuals from the surrounding communities. A third public scoping meeting was held from 4:00 to 8:00 PM in Unity, Maine, at Unity College on April 13, 2011. This meeting was attended by 12 individuals. Refuge and planning team staff were also in attendance at all three meetings.

The official comment period for initial public scoping to identify issues and opportunities for the CCP ended on April 30, 2011.

Steps C and D: Vision, Goals, and Alternatives Development
Following the public scoping period, the core team compiled and summarized all comments received. In doing so, the Service initiated "Step C: Review Vision Statement and Goals and Determine Significant Issues." Through a series of conference calls and emails, the core team reviewed comments received and identified key issues to be addressed throughout the development of the CCP. At the same time, the core team evaluated the draft vision and goals presented during scoping. During this evaluation, the core team decided to reorganize the draft goals to better reflect the individuality of each refuge unit. This was motivated by two primary factors: (1) many individual comments received during scoping pertained to particular refuge units and people's interest in a particular unit, and (2) each refuge unit and the WPA contain unique habitats and features and are managed individually.

From August 2012 through January 2013 the core tram has been working on "Step D: Develop and Analyze Alternatives." On August 9 and 10, the core team met in person at the USFWS Ecological Services Office in Orono, ME to discuss key issues and develop appropriate management considerations.

As part of this initial development of alternatives, the core team considered management alternatives at the Sunkhaze Meadows Unit that included special use designations such as wilderness area or research natural area. To further evaluate special designations as alternatives, in January 2012, we distributed a public notice and newsletter describing the consideration of special designations, specifically wilderness area designation and invited interested individuals to attend a public meeting to learn more about the consideration and obtain public input. This newsletter was distributed to 452 contacts, 112 of these received the newsletter via email, and the remaining 340 were mailed hard copies. The public notice was also published on February 3, 2012, in a local newspaper, the SV Weekly.

The Sunkhaze Meadows Unit wilderness consideration public meeting was held on Thursday, February 9, 2012, at the Milford town hall. In total, 38 people from the general public attended the meeting. The refuge manager described the purpose of the meeting, the current status of our CCP/EA planning efforts, and the Wilderness Act criteria and how the Service delineated the potential wilderness area designation for the Sunkhaze Meadows Unit. The Service then facilitated public input while recording the comments on flip charts.

Following this meeting, the Service reviewed and considered comments received and determined not to pursue special designations at the Sunkhaze Meadows Unit. In early August 2012, the Service distributed a newsletter updating the public on the Service's decision not to pursue a wilderness area designation. This newsletter was distributed to the same 452 contacts noted in the January 2012 newsletter distribution.

Step E: Draft CCP and NEPA Document
This draft CCP and EA represents "Step E: Prepare Draft Plan and NEPA Document." The Service will publish a Notice of Availability (NOA) in the *Federal Register* announcing the release of this document for its 30-day period of public review and comment. During the comment period, the Service will also hold public meetings to obtain comments on the document. We expect to receive comments by regular mail, electronic mail, and at the public meetings. We will also prepare and distribute a newsletter summarizing the three management alternatives for the draft CCP and EA to coincide with the publication of the NOA. After the comment period, the Service will review and summarize all of the substantive comments we have received, develop our responses, and publish them as an appendix to the final CCP.

Step F: Adopt Final Plan
Once the final CCP has been prepared, it will be submitted to our Regional Director for approval. The Regional Director will determine whether the CCP warrants a Finding of No Significant Impact (FONSI), and whether its analysis is sufficient to simultaneously issue a decision adopting the CCP. If the Regional Director has concerns, the planning team may be required to revise the EA or complete an environmental impact statement (EIS). The Service will announce the Regional Director's final decision and the final CCP by publishing Notice(s) of Availability in the *Federal Register*. That will complete "Step F: Prepare and Adopt a Final Plan."

Steps G and H: Implement, Evaluate, and Revise the Plan
With the planning phase of the CCP process complete, "Step G: Implement Plan, Monitor and Evaluate" will begin. As part of "Step H: Review and Revise Plan," the Service will modify or revise the final CCP, as warranted, following the procedures in Service policies 602 FW 1, 3, and 4 and the NEPA requirements. Minor revisions that meet the criteria for categorical exclusions (550 FW 3.3C) will require only an environmental action memorandum. As the Refuge Improvement Act and Service policy stipulate, the Service will review and revise the CCP at least every 15 years.

Issues, Concerns, and Opportunities

The Service defines an issue as "any unsettled matter requiring a management decision" (USFWS 2010). Issues can include an "initiative, opportunity, resource management problem, threat to a resource, conflict in use, or a public concern." Issues arise from many sources, including refuge staff, other Service programs, state agencies, other Federal agencies, Tribes, other partners, neighbors, user groups, or Congress. One of the distinctions among the proposed management alternatives is how each addresses those issues.

From agency and public meetings and planning team discussions, we developed a list of issues, concerns, opportunities, and other items requiring a management decision. We placed them in two categories: key issues and issues outside the scope of the draft CCP and EA.

Key issues—Key issues are those the Service has the jurisdiction and authority to resolve. The key issues, together with refuge goals, form the basis for developing and comparing the different management alternatives we analyze in chapter 3. The varying alternatives were generated by determining different options for addressing key issues that also conform with the goals and objectives. We describe the key issues in detail below.

Issues and concerns outside the scope of this analysis—These issues do not fall within the scope of the "purpose of, and need for, action" in this draft CCP and EA. These issues are discussed after the key issues below, but are not addressed further in this document.

Following is a summary of the issues that arose during the scoping process.

Key Issues

We derived the following key issues from public and partner meetings and further team discussions. The three management alternatives in chapter 3 are distinguished by how well each alternative supports refuge goals and addresses these issues.

Facilities, Infrastructure, and Staffing

1. *At what levels does the Service plan to continue staffing and management of the refuge?*

The lack of Service personnel at the refuge was raised several times by the public during scoping. Perceptions expressed during scoping were that the refuge has been abandoned or that the Service did not care about the future of the property. The long-term vision for the refuge includes staff stationed out of the Sunkhaze Meadows NWR. However, like all management decisions, the actual implementation of staffing is dependent upon budget availability.

How the refuge will respond to staffing concerns is noted in the refuge administration discussion for each alternative discussed in chapter 3.

Habitat and Wildlife Management

1. *How will the refuge address potential impacts of climate change on existing refuge habitats?*

Climate change and its corresponding effects on species migrations or range distributions, extreme shifts in temperature and precipitation, and invasive species introductions may potentially pose dramatic threats and alterations to the habitats encompassed within the refuge. The ability to adapt or address these ever-changing concerns requires a comprehensive understanding of the refuge's landscape context, individual habitats, species utilization, and their resilience.

Sunkhaze Meadows NWR and Carlton Pond WPA are located within the range of inland spruce–fir dominated plant communities. Many of the refuge habitats have developed under the climate conditions present over the past 8,000 years. Given the projections for shifts in mean temperature and precipitation for the region, new introductions of both native and nonnative species are possible results of climate change.

Potential impacts of climate change are discussed in chapter 2 and how the refuge will respond to its implications is noted in goals 1 through 3 for each alternative discussed in chapter 3.

2. *How will the refuge protect or improve its biological integrity in light of landscape-level ecological concerns such as biological connectivity with other nearby habitats?*

Fragmentation of both terrestrial and aquatic habitats can have adverse effects on many plant, fish, and wildlife species: reducing biodiversity, limiting genetic diversity, and increasing susceptibility to species invasion and other stressors. Activities such as logging, agriculture, or residential development can create a patchwork of forest, wetland, and grassland habitats. Dams, culverts, and other water control structures can fragment the available aquatic habitat in a similar manner.

The units encompassed by Sunkhaze Meadows NWR and Carlton Pond WPA are each fragmented to varying degrees. Sunkhaze Meadows Unit near Milford and Carlton Pond WPA near Unity are abutted by large acreages of private forest lands, some of which have been recently logged. As a result, while these areas still provide habitat for some species, it does represent a fragmentation of late successional forest lands. Other units, such as Sandy Stream and Benton, are surrounded by roads, residential property, and agriculture, which also result in fragmentation of the habitats available onsite.

We envision partnering with a variety of Federal, State, and non-governmental organizations to address these landscape-level concerns to the refuge. How the refuge will respond to connectivity needs is noted in goals 1 through 3 for each alternative discussed in chapter 3.

3. *How will the refuge balance early successional habitat management for species like American woodcock with late successional habitat management?*

Sunkhaze Meadows NWR and Carlton Pond WPA provide important habitat for many State-listed birds and other species of conservation concern across the region. Among these are species such as the American woodcock, identified in many state, regional, and national plans as a priority species. It is listed as a species of highest conservation priority in BCR 14 (Dettmers 2006). Woodcock require an assemblage of early successional habitat including clearings for courtship (singing grounds), large openings for night roosting, shrub and sapling stands (0 to 15 years) for foraging, as well as young, second-growth hardwoods or mixed woods (15 to 30 years) for nesting, feeding, and brood-rearing (Sepik et al. 1981, Keppie and Whiting 1994).

Many of the bird species of conservation concern in the Northeastern U.S. are not entirely dependent on late-successional or old-growth forest (Hagan and Grove 1999); however, there are some at-risk species that are primarily dependent on the habitat features found in older forests.

Birds of conservation concern that feed and nest within these late-successional forests at Sunkhaze Meadows Unit and elsewhere include bay-breasted warbler, Canada warbler, wood thrush, eastern wood-pewee, chestnut-sided warbler, blackburnian warbler, black-throated-blue warbler, and bald eagles. In addition, older forests have ecological processes that are mostly absent from young forests (Hagan and Whitman 2007). These species and processes require areas of long-term preservation in order to be sustained in perpetuity. This level of protection is not typically available with private lands, where changes in ownership can result in differing land use. Equally, other conservation lands managed by State, Federal, or local partners may change over time or have management goals that do not promote mature forest preservation. Therefore, a management emphasis on late successional forest is important to sustaining the biological integrity, diversity, and environmental health of the Atlantic Northern Forest region.

Throughout this planning process, we have considered both the availability of habitat on a regional scale, while also considering our ability to successfully manage these types of habitats across refuge units and the WPA. How the refuge will balance early successional habitat management with late successional habitat management is noted in goals 1 through 3 for each alternative discussed in chapter 3.

4. *What are the biological inventory and monitoring needs for the refuge and WPA and how will the Service meet them?*

Scientifically sound inventory and monitoring is important for the Service to understand what resources and species are present on refuge and WPA lands. Inventory and monitoring helps us increase our knowledge of those resources that we are striving to conserve and protect. In some cases, it can also help us evaluate how species or habitats respond to our management actions. A renewed emphasis on inventory and monitoring that helps inform on the ground management actions is an important recommendation of the recent *Conserving the Future* conference and final vision document, and the Service has recently expanded national funding for inventory and monitoring efforts.

Without dedicated staff to Sunkhaze Meadows NWR and Carlton Pond WPA, it is difficult for the Service to conduct the level of inventory and monitoring necessary to adequately inform management. We plan to work with the Service's regional inventory and monitoring staff, as well as area partners (e.g., local universities) to accomplish our inventory and monitoring needs. How the refuge will respond to the need for inventory and monitoring is noted in goals 1, 2, 3, and 7 for each alternative discussed in chapter 3.

5. *How will the refuge manage for deer populations?*

As described in section 1.3, Congress entrusts the Service with the conservation and protection of specific national natural resources: migratory birds and fish, federally listed threatened or endangered species, interjurisdictional fish, wetlands, certain marine mammals, and national wildlife refuges. Because of this mandate, local game species (those that typically do not migrate across state lines, such as white-tailed deer) are managed by state fish and wildlife agencies. In Maine, the Department of Game and Inland Fisheries defines and enforces the series of regulations and management actions to maintain the State's deer population.

However, biological management for Federal trust species proposed within this plan would continue to provide habitat for local white-tailed deer populations. In addition, the Sunkhaze Meadows Unit contains a known deer overwintering yard that may provide important shelter during hard winter conditions. Similar deer yards located on adjacent private lands have recently been lost due to logging. As a result of the biological management proposed, this deer yard will be protected under all alternatives.

This concern and the relation of white-tailed deer to habitat management is discussed in goals 1 through 3 for each alternative discussed in chapter 3.

6. *How will the refuge manage invasive, nonnative, and overabundant species?*

Nonnative, invasive plant species such as phragmites (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) threaten refuge and WPA habitats by displacing native plant and animal species, degrading natural communities, and reducing natural diversity and wildlife habitat values. They can out-compete native species by dominating light, water, and nutrient resources, and are particularly damaging when they dominate and overtake native habitats, as when phragmites dominates an entire wetland plant community.

The Sunkhaze Meadows Unit and Carlton Pond WPA are relatively free of invasive species. In these areas, prevention will be the key focus of invasive species management. In other areas, such as Benton Unit and Sandy Stream Unit, invasive species such as reed canarygrass (*Phalaris arundinacea*) have invaded wetland habitats and require active control to minimize their impacts on refuge habitats.

There are additional concerns that other invasive species such as nonnative insects, fish, and other animals should be considered and managed as well. Some climate change estimates also predict a shift of species distributions or conditions across the region that may allow introductions of additional species in the future.

How we respond to these concerns is discussed in goals 1 through 3 for each alternative discussed in chapter 3.

7. *How will the refuge manage the smaller Benton and Sandy Stream units in light of limited staff resources?*

Several comments were received pertaining to the ongoing management of two of the smaller units managed as part of Sunkhaze Meadows NWR. Benton and Sandy Stream Units are each located roughly an hour's drive away from the Sunkhaze Meadows Unit and the Maine Coastal Islands NWR staff headquarters in Rockland, Maine. Because of limited staff time and the distance from the refuge's current headquarters, both the Benton Unit and Sandy Stream Unit have had minimal management or monitoring by the Service.

How the refuge will respond to concerns regarding Benton and Sandy Stream units are noted in goals 3, 6, and 7 for each alternative discussed in chapter 3.

Visitor Services Management

For national wildlife refuges, providing wildlife-dependent recreation opportunities is also a priority. It creates the opportunity for many visitors to experience the lands that refuges protect and see the value behind the conservation work that the Service does. Providing public access and recreational use is an important issue addressed in this draft plan. The planning team received many opinions on specific actions or techniques to improve opportunities for wildlife-dependent recreation on the refuge and WPA.

Specific questions asked regarding the topic of visitor services, include:

1. *What is designated Wilderness and how would this affect public use and management of refuge lands?*

The Wilderness Act of 1964 established the National Wilderness Preservation System and a process for federal agencies to recommend wilderness areas to Congress. There are 75 wilderness areas on 63 units of the Refuge System in 26 states. About 90 percent of the Refuge System wilderness is in Alaska.

Wilderness, as defined by the Wilderness Act, is untrammeled (free from human control), undeveloped, and natural, offering outstanding opportunities for solitude or primitive recreation. Wilderness visitors may hunt, fish, and observe and photograph wildlife, if these activities are compatible with the refuge's primary mission of wildlife conservation. Many other types of compatible recreational uses, such as cross-country skiing, canoeing, kayaking, and hiking may also be enjoyed in wilderness areas (USFWS 2011b).

After completing the wilderness review, we do not intend to recommend wilderness designation on any of the refuge units or WPA at this time. The completed wilderness review is included as appendix C.

2. *What is the purpose of Wild and Scenic River designation, how is a Wild and Scenic River designation made, and how would this affect public use and management of refuge lands?*

The Wild and Scenic Rivers Act provides a national policy and program to preserve and protect selected rivers, or segments of rivers, in their free-flowing condition in the National System. Wild and scenic river designation seeks to protect and enhance a river's current natural condition and provide for public use consistent with retaining those values. Designation affords certain legal protection from adverse development, e.g., no new dams may be constructed, nor federally assisted water resource development projects allowed that are judged to have an adverse effect on designated river values.

When completing land and water planning (e.g., CCPs) on Federal lands, agencies are required to initiate a wild and scenic river review. The review included in this document only applies to Service-owned lands, and only addresses our determinations of river eligibility and

classifications. These determinations are tentative, and are subject to further consideration during the study phase which we will complete sometime after the CCP is completed. At this time, we do not know when we might be able to complete the suitability study. We expect it will be several years.

Agencies by themselves cannot designate rivers under this act. If we determine that there are eligible and suitable segments (as defined by the act), we would prepare a separate legislative environmental impact statement and submit it with the results of the suitability study to the Director of the Service and ultimately to Congress for potential designation. This is a long process and there would be several opportunities for public involvement.

The results of our draft Wild and Scenic Review do not affect recreational use of Sunkhaze Stream or its tributaries, including access for boating, fishing, or hunting at current or expected levels of use. Wild and scenic river designation, if it occurs, is not expected to affect these uses either. For more information, please see the draft wild and scenic river review (appendix D).

3. *How will the Service address snowmobiling on refuge lands? Will the refuge remain open to snowmobiling? Will snowmobiling be expanded?*

Sunkhaze Meadows NWR currently allows snowmobiling in designated locations on several refuge units. Sunkhaze Meadows Unit contains a 3-mile segment of the Interconnected Trail System (ITS) trail along the western portion of the unit. Benton and Sandy Stream Units also contain smaller segments (1 mile or less) of local or regional snowmobile trails. These segments are maintained by local snowmobile clubs, which is authorized under a special use permit issued by refuge staff.

We intend to maintain snowmobile access similar to current levels under all alternatives. Specifics on how we will address snowmobiling on Service lands are noted in goals 4, 5, and 6 for each alternative discussed in chapter 3.

4. *How will the refuge continue to support hunting opportunities?*

As previously mentioned, hunting is one of the priority public uses identified in the Refuge Improvement Act. We received several comments from interested members of the public both supporting and opposing hunting on refuge lands. Currently, the refuge is open to all State seasons, according to State regulations with one exception, coyote hunting. Some commenters requested we more closely align refuge regulations with State regulations, specifically by expanding the coyote hunting season and revising refuge hunter orange requirements to mirror State regulations.

As Federal lands, season dates and refuge-specific regulations apply on all refuge properties. To the extent practicable, refuges align their regulations with state regulations. Because of the Refuge System’s wildlife first mission and the need to balance hunting with other priority public uses, refuge hunting regulations are sometimes more restrictive than State regulations. Because changing the refuge and WPA hunter orange requirements was minor, we were able to modify

them to be consistent with State regulations in 2012. We have discussed coyote hunting on refuge and WPA lands previously (see issue 5, Habitat and Wildlife Management).

All three alternatives provide opportunities for hunting on Service lands. Specifics of how the refuge will address hunting are described in goals 4 through 6 for each alternative discussed in chapter 3.

5. *How will the refuge continue to support trapping opportunities?*

Trapping is not included as a priority public use under the Refuge Improvement Act. Trapping is currently allowed on refuge units and at Carlton Pond WPA as a management activity. We control this activity by issuing special use permits. We are not proposing any changes to the refuge's current trapping program under any of the alternatives. How the refuge will address trapping is noted in chapter 3, under common to all.

6. *What will the refuge do to improve access to the various refuge units?*

Having access to the refuge by way of parking lots, trails, boardwalks, and other infrastructure is an important issue for many people who provided comments during scoping. These access points and trails are used by visitors to engage in various recreational uses, as well as by Service staff for management purposes.

Infrastructure requires regular maintenance to provide safe and open access. In recent years, some of the existing infrastructure at the Sunkhaze Meadows Unit has fallen into disrepair. Trails have become blocked or overgrown. Boardwalks have buckled as a result of frost heave. Maintenance of these access areas is important to provide continued, safe public use. Current interpretive kiosks are out of date as well.

Another concern at the Sunkhaze Meadows Unit is limited access to Sunkhaze Stream. Many visitors access the refuge via small boats. Currently, the refuge's only access point for the stream is at the far northern end of the refuge. Boaters need to portage their boats over 1,000 feet to reach the stream and launch. Commenters requested additional access to Sunkhaze Stream, particularly at the southern end near its confluence with the Penobscot River and State Route 2.

Other refuge lands have varying degrees or types of access. Carlton Pond WPA has no trail system, because of limited upland areas and the dominance of open water and emergent wetlands. However, many people enjoy paddling Carlton Pond to observe wildlife. At the Benton and Sandy Stream units, no formal trail systems exist, although each unit does contain snowmobile trails that are used for winter transportation and for occasional wildlife observation during the warmer months. Several comments were received asking the refuge to consider improving access on these units for wildlife observation and other uses.

How the refuge will respond to access concerns are noted in goals 4 through 6 for each alternative discussed in chapter 3.

7. *How does the refuge plan to improve its public use programming, including environmental education and interpretation?*

Environmental education and interpretation are two priority public uses outlined under the Refuge Improvement Act and are important ways of reaching out to the public. Currently, we provide a limited number of presentations upon request. In the absence of staff, the Friends of Sunkhaze Meadows provide an important role in connecting people to the Sunkhaze Meadows Unit by providing regular environmental interpretive programming on refuge lands. The Service would like to improve its support for the Friends organization and programming, as well as create additional Service-led programs, if resources are available

Others are interested in the possibility of additional environmental education or interpretive programs at Carlton Pond WPA, Benton Unit, or Sandy Stream Unit. Providing programming at these units would require refuge staff or a partnership with local organizations to develop and lead events. How the refuge will respond to public use programming concerns are noted in goals 4 through 6 for each alternative discussed in chapter 3.

8. *How does the refuge plan to address cultural and historic resources related to the refuge?*

The lands and waters comprising Sunkhaze Meadows Unit have been important to the Penobscot Indian Nation for thousands of years. The refuge continues to have cultural and historic significance to the Penobscot Nation. Other Tribes such as the Passamaquoddy Tribe, Houlton Band of Maliseet Indians, and Aroostook Band of Micmacs also have historic or cultural connections to refuge units. Sunkhaze Meadows Unit is known to contain at least one archaeological site and others may exist. Preservation and interpretation of these resources is an interest to many of those who provided initial comment during scoping.

To date, no cultural or historic resources have been identified at Carlton Pond WPA or at Benton or Sandy Stream Units. Still, their locations may provide opportunities for future interpretation of Native American or early European settlement cultural history.

How the refuge will respond to cultural and historic resource concerns are noted in goals 4 through 6 for each alternative discussed in chapter 3.

9. *How will the refuge utilize partnerships with area agencies, businesses, and organizations to benefit resource conservation and visitation?*

Regardless of the alternative, the Service would not be able to accomplish all its desired management for the refuge and WPA alone. To achieve its management goals, the Service will need to rely heavily on partnerships with Tribal, State, and local agencies, and other organizations.

Members of Tribal and State agencies have offered suggestions for ways the Service can partner on its biological management and public use goals. Local municipalities and non-governmental

organizations have offered recommendations for ways partnerships can improve refuge visitation and public use offerings.

How the refuge will respond to potential partnerships is noted in goal 7 for each alternative discussed in chapter 3.

Issues and Concerns Outside the Scope of this Analysis

The following issue was raised during public meetings. It is outside the jurisdiction and authority of the Service and will not be addressed further within the CCP.

1. *Can the refuge harvest natural resources from refuge lands in order to fund refuge staff positions?*

Several comments were received during scoping inquiring into what opportunities might be available for resource harvesting on the refuge with the specific intention of using funds generated to support a refuge staff position. Resource harvesting is occasionally allowed in circumstances where it is deemed to be compatible with refuge goals and to fulfill wildlife habitat objectives. To date, no commercial resource harvesting has been allowed on the refuge.

According to Service policy, national wildlife refuges cannot use funds generated on the refuge for staff positions or other onsite improvements. Funds obtained from the sale or harvest of timber, peat, or other resources on a refuge are deposited into the national budget. They are then distributed as part of the Refuge Revenue Sharing Program, which distributes these funds to municipalities to offset losses in tax revenue from any tax-exempt Federal lands in their jurisdiction. Staffing levels at Sunkhaze Meadows NWR and Carlton Pond WPA are subject to approval of the Service's Northeast Region Assistant Regional Director of the Refuge System and are based on Federal budget allocations.

Plan Amendment and Revision

Periodic review of the CCP will be required to ensure that objectives are being met and management actions are being implemented. Ongoing monitoring and evaluation will be an important part of this process.

Monitoring results or new information may indicate the need to change our strategies. At a minimum, CCPs will be fully revised every 15 years. We will modify the CCP documents and associated management activities as needed and we will follow the procedures outlined in Service policy, the Refuge Improvement Act, and NEPA requirements, and other Federal mandates.

Chapter 2

Dan Salas, Cardno JFNew

View of Carlton Pond

Affected Environment

- **Introduction**
- **Physical Landscape**
- **Refuge and WPA Biological Resources**
- **Cultural Landscape Setting and Land Use History**
- **Socioeconomic Environment**
- **Refuge and WPA Administration**
- **Refuge and WPA Public Use**
- **Archaeological and Historical Resources**

Introduction

This chapter describes the current and historic physical, biological, and socioeconomic landscape of Carlton Pond WPA and the three units comprising Sunkhaze Meadows NWR (Sunkhaze Meadows, Benton, and Sandy Stream Units). Included are descriptions of the physical landscape, the regional context and its history, and the refuge environment, including its history, current administration, programs, and specific refuge resources.

The 11,484-acre Sunkhaze Meadows Unit is located in the town of Milford, Penobscot County, approximately 14 miles northeast of Bangor, Maine. The refuge is about 3 miles east of the Penobscot River and roughly bounded on the west by Dudley Brook, on the south and east by County Road, and on the north and east by Stud Mill Road. Sunkhaze Stream bisects the refuge along a northeast to southwest orientation and, along with its six tributaries, creates a diversity of wetland communities. The bogs and stream wetlands, adjacent uplands and associated transition zones, provide important habitat for many wildlife species. The wetland complex consists primarily of wet meadows, shrub thickets, cedar swamps, extensive red and silver maple floodplain forests and open freshwater stream habitats, along with plant communities associated with peatlands, such as shrub heaths and cedar and spruce bogs.

The 334-acre Benton Unit is in the town of Benton, Kennebec County, about 5 miles northeast of Waterville, Maine. This unit is just east of the Sebasticook River and is bounded by Route 139 on the west, Fowler Brook to the east, and Albion Road to the south. The Service acquired this property from the Farmers Home Administration. This unit includes wetlands and breeding habitat for sedge wrens (*Cistothorus platensis*), a State-listed endangered species, although sedge wrens have not been observed on the unit since then. About one-third of the Benton Division is maintained as grassland and two-thirds is second growth mixed softwood-hardwood forest. Historically, the land was drained to provide pasture for dairy cows. In 1993, the Service installed three dikes to restore some small wetland habitats ranging from one-quarter to 2 acres at the site.

The 58-acre Sandy Stream Unit was acquired along with the Benton property and is located in the town of Unity, Waldo County. This parcel is primarily old pasture with a variety of shrub species. The unit is bounded on the east by Sandy Stream that flows north into Unity Pond, west by Prairie Road, and to the south by town-owned land that abuts Route 139.

The 1,068-acre Carlton Pond WPA is located in the town of Troy, Waldo County, about 7 miles north of Unity, Maine. Waterfowl production areas are wetlands (and surrounding uplands) that provide breeding, resting, and nesting habitat for waterfowl, shorebirds, waterbirds, and other wildlife. The original rock dam at Carlton Pond was built in 1850 to power a local sawmill. The Service reconstructed the dam in 1972 and manipulates water levels using a water control structure. The pond is approximately 295 acres of open water and 489 acres of emergent marsh; the remainder of the WPA is upland forest and peat bog. Carlton Pond WPA provides nesting areas for a population of black terns (*Chlidonias niger*), a State-listed, endangered species.

Physical Landscape

Landscape Perspective

Sunkhaze Meadows NWR and Carlton Pond WPA lie within the Gulf of Maine watershed, an immense area extending from eastern Quebec Province in Canada to Cape Cod, Massachusetts. Maine is the only state located entirely within the watershed boundary. The Gulf of Maine watershed encompasses, among others, the great rivers of Maine (St. John, Penobscot, Kennebec, Androscoggin, and Saco) and the coastal drainages of Downeast Maine. The Sunkhaze Meadows Unit is within the Penobscot River watershed. Carlton Pond WPA and the Benton and Sandy Stream Units are in the Kennebec River watershed. These refuge lands lie in the south central region of Maine (see map 1.1 and 1.2).

Regional conservation initiatives in Maine span the State from the "Mount Agamenticus to the Sea" collaboration in southern Maine to the "Mahoosuc Initiative" straddling the western border with New Hampshire, and efforts to protect Cobscook Bay and the Downeast Lakes in Washington County. A partnership between The Nature Conservancy and the Forest Society of Maine is working to conserve 42,000 acres southeast of the Sunkhaze Meadows Unit. In addition to refuge lands, this would augment lands owned by the Maine Department of Conservation (Bradley and Greenfield Units and Nicatous easement) and the U.S. Forest Service (Penobscot Experimental Forest). This partnership known as the Lower Penobscot Forest Project would further buffer the refuge from future development and protect headwaters of several tributaries that flow into Sunkhaze Stream (TNC 2011).

The Sebasticook Regional Land Trust (formerly the Friends of Unity Wetlands) is active in the area around the Benton and Sandy Stream Units (FUW 2006). Their 42,000-acre Unity Wetlands Focus Area is a large expanse of wetlands and uplands centered on Unity Township, extending east to Unity Pond and west to the Sebasticook River, covering about 65 square miles. The Sebasticook River from its mouth upstream several miles is the best habitat in the State for at least two rare mussels, tidewater mucket (*Leptodea ochracea*) and yellow lampmussel (*Lampsillis cariosa*). These mussel populations extend into some of the tributaries including Sandy Stream. The focus area's floodplain forests also provide habitat for wood turtles and yellow-throated vireos, which are both State-rare, streamside forest specialists. The Unity Wetlands landscape is characterized by working farms and forests and is known as part of Maine's Dairy Belt (Friends of Unity Wetlands 2006).

Climate

Sunkhaze Meadows NWR and Carlton Pond WPA lie within the Central Interior biophysical region of Maine (McMahon 1990). The climate of this region is transitional between the more moderate climate of the coast and more extreme continental conditions (i.e., colder winters, warmer summers) further inland. Summers are warm and the frost-free season of 140 to 160 days is comparable to that of the coastal zone. Mean maximum July temperature is 80° F. Winter temperatures are relatively mild with a mean minimum January temperature of 10° F. Snowfall averages 80 inches per year, intermediate between coastal and northern regions. Vegetation

associations, which are in part a reflection of climate, in the Central Interior region are transitional from Appalachian forests of oaks, pine, and mixed hardwood in the south to more boreal spruce-fir and northern hardwood forests in northern and eastern Maine. Similarly, wetland types are transitional in this region, with red maple swamps and vernal pools more common in the southwest part of the region and peatlands more common farther north and east (McMahon 1990).

There is consensus among the scientific community that climate change will lead to significant impacts across the U.S. and the world (Joint Science Academies' Statement 2005). The effect of climate change on wildlife and habitats is expected to be variable and species specific, with a predicted general trend of species' distributions shifting northward. Current global climate change models developed by the U.S. Forest Service Northern Research Station predict that the range of spruce-fir forest cover type will recede substantially north of the Sunkhaze Meadows Unit by the end of the present century (Prasad et al. 2007).

Climate change is expected to affect Maine's ecosystems and biodiversity in several ways, such as shifting species distributions, increasing drought stress for plant communities and aquatic systems, raising air and water temperatures, amplifying pest and disease outbreaks, and increasing plant growth fertilized by higher ambient carbon dioxide levels. In Maine, all groups of native species are predicted to be greatly affected by climate change and the corresponding shift in habitat, food resources, weather, and competition (Whitman et al. 2010). In addition, global climate changes are predicted to affect natural disturbance patterns over time by altering the timing and frequency of events such as flooding, fires, and other severe weather events (Lorimer 2001).

The effect of climate change on wildlife and habitats is expected to be variable and species specific, with a predicted general trend of species' distributions shifting northward. Global climate change models developed by the U.S. Forest Service Northern Research Station predict that the range of spruce-fir forest cover type will recede substantially beyond the refuge boundaries to the north by the end of the present century (Prasad et al. 2007). Climate change is expected to affect Maine's ecosystems and biodiversity in several ways, such as shifting species distributions, increasing drought stress for plant communities and aquatic systems, raising temperatures, amplifying pest and disease outbreaks, and increasing plant growth fertilized by higher ambient carbon dioxide levels (Whitman et al. 2010).

Hydrology and Water Quality

The lands comprising Sunkhaze Meadows NWR and Carlton Pond WPA are within two distinct watersheds. Sunkhaze Stream, which flows through Sunkhaze Meadows Unit, drains into the Penobscot River. Carlton Pond WPA and Benton and Sandy Stream Units are in the Sebasticook River Watershed, which in turn flows into the Kennebec River. The landscapes of both watersheds impact the water quality of both systems.

Penobscot River – Sunkhaze Stream

The Penobscot River, New England's second largest river system, drains into an 8,570-square mile watershed. The West Branch starts near Penobscot Lake in western Maine, on the border between Maine and Quebec Province, Canada. The East Branch begins at East Branch Pond near

the headwaters of the Allagash River in north-central Maine. The two branches join in the town of Medway near East Millinocket, more than 60 miles to the north of the Sunkhaze Meadows Unit. The main stem of the Penobscot River empties into Penobscot Bay, along the Maine coast, near the town of Bucksport.

Sunkhaze Stream is approximately 20 miles long and begins as a series of seeps and springs. The stream and its tributaries flow through three townships (Greenfield, Greenbush, and Milford) before reaching the Penobscot River in Milford. The Sunkhaze Meadows Unit encompasses 5 miles of Sunkhaze Stream and another 16 miles of tributary streams that include Buzzy, Little Buzzy, Baker, Dudley and Johnson Brooks, and Birch and Little Birch Streams. The portion of Sunkhaze Stream within the refuge is generally comprised of three river segments. The lower section contains a deep, wide, channelized stream surrounded by a hardwood canopy, dominated by silver maples, that shades the water. Middle portions of Sunkhaze Stream are bordered by emergent marsh and grassy wet meadow and contain a string of beaver dams and ponds connected by slow-moving runs. Upstream of Johnson Brook, alders and other shrubs and trees form a canopy, then the grade increases creating a series of riffles, runs, and pools below Stud Mill Road (Smithwood and McKeon 1999). Sunkhaze Stream, north of Stud Mill Road and outside refuge lands, and has a series of riffles and falls separated by long stretches of slow meandering water. This section supports some of the most important brook trout fisheries in the Bangor area (Rupp 1955, Stockwell and Hunter 1983, Smithwood and McKeon 1999).

Sunkhaze Stream, with a watershed of approximately 100 square miles, flows in a westerly direction to its confluence with the Penobscot River. During spring snowmelt periods, waters from the Penobscot River flow up Sunkhaze Stream and down the Otter Chain Ponds, causing the entire bog area to become a large lake (USFWS 2001).

Sunkhaze Stream and its tributaries are classified as Class AA waters by Maine Department of Environmental Protection (MEDEP MRS Title 38 467 7(C)(8)). According to MEDEP, “Class AA shall be the highest [water] classification and shall be applied to waters which are outstanding natural resources and which should be preserved because of their ecological, social, scenic or recreational importance” (MEDEP MRS Title 38 464 1(A)). Class AA waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection, fishing, agriculture, recreation in and on the water, navigation, and as habitat for fish and other aquatic life. The habitat must be characterized as free-flowing and natural.” The main stem of the Penobscot River in this region is classified as Class B water, defined as waters of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life (MDEP 2011c).

Kennebec River – Sebasticook River and Tributaries

The Kennebec River begins at Moosehead Lake in west-central Maine, and flows 150 miles to its outflow into Merrymeeting Bay in the town of Richmond. The Sebasticook River is the largest tributary to the Kennebec River. The Sebasticook River begins in Dexter and flows 50 miles, draining 985 square miles before reaching the Kennebec River, about 16 miles upstream of Merrymeeting Bay (Maine Rivers 2011).

The Benton Unit of Sunkhaze Meadows NWR lies along a portion of Fowler Brook, which flows north directly into the Sebasticook River in the town of Benton. Carlton Pond drains into Carlton Stream, one of three major tributaries that flow into Unity Pond. Sandy Stream flows north into Unity Pond just at its outlet. The outlet of Unity Pond is Twenty-Five Mile Stream, which joins the Sebasticook River in the town of Burnham. Typically, Sandy Stream flows north and into the wetland area southwest of the Unity Pond outlet and then into Twenty-Five Mile Stream. However, during significant rain events and when lake water levels are low Sandy Stream may bypass Twenty-Five Mile Stream and flow directly into Unity Pond, greatly increasing the watershed of the Pond (MDEP 2004).

According to the MDEP Water Classification Program Report (Title 38, Article 4-A), the Sebasticook River main stem, including all impoundments—from the confluence of the East Branch and the West Branch to its confluence with the Kennebec River is classified as Class C water. This is the 4th highest classification in Maine and is defined as suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life. Tributaries in the Sebasticook River are classified as Class B water (MDEP 2011c). Unity Pond has a history of supporting excessive amounts of algae in the late summer and early fall, due in large part to the contribution of phosphorus that is prevalent in area soils and that has accumulated in the pond bottom sediments (MDEP 2004).

Geology and Soils

Continental glaciers probably extended across Maine several times during the Pleistocene Epoch, which lasted from about 2.5 million to 10,000 years ago. The slow-moving glacial ice changed the landscape as it scraped across mountains and valleys, eroding and carrying rock debris. The sand, gravel, and other unconsolidated sediments that cover much of Maine are largely the products of that glaciation. Glaciation also changed drainage patterns and helped create the hundreds of modern ponds and lakes scattered across the State (MGS 2005).

The most recent glacial period in Maine began 35,000 years ago, when the Laurentide Ice Sheet spread across southern Quebec and New England. During its peak development, this ice sheet was centered over eastern Canada and flowed east to southeast across Maine. It became several thousand feet thick and covered the highest mountains in the State (MGS 2005). The Laurentide Ice Sheet started to recede as early as 21,000 years ago, soon after it reached its terminal position on Long Island, New York (Sirkin 1986). The ice margin receded to the present position of the Maine coast by 17,000 to 16,000 years ago (Borns et al. 2004).

The land previously underneath the glacier was still depressed by the weight of the ice sheet, causing ocean waters to flood southern Maine as the glacier continued retreating. Ocean waters extended up into the Kennebec and Penobscot valleys, reaching present elevations to at least 420 feet above current mean sea level in central Maine (MGS 2005). Consequently, the lowlands of the lower Kennebec and Penobscot River valleys were filled with glaciomarine clays and silts (McMahon 1990). The last remnants of glacial ice were gone from Maine by about 11,000 years ago (MGS 2005). The modern network of streams became established soon after glaciers receded and organic deposits began to form in peat bogs, marshes, and swamps. Tundra vegetation

bordering the ice sheet was replaced by changing forest communities as the climate warmed (Davis and Jacobson 1985).

Most of the soils (more than 70 percent) on the Sunkhaze Meadows Unit are poorly or very poorly drained; the dominant soil types include peat and muck, Monarda and Burnham, Biddeford, Buxton-Scantic-Biddeford, and Scantic. The primary well-drained soils at Sunkhaze Meadows Unit include Howland, Plaisted, and Thorndike (USDA 2011).

The dominant soil types on the Benton Unit are poorly drained Scantic silt loam and Ridgebury very stony fine sandy loam. These soils underlie much of the fields including the entire field area around the small diked wetlands. Well-drained soils at this unit include Scio, Woodbridge, and Paxton-Charlton soil types, which are primarily in the eastern half of the unit (USDA 2011).

The soils at the Sandy Stream Unit include the poorly drained Limerick and Rumney soils, and moderately well-drained Podunk fine sandy loam. The poorly drained soils underlie much of the shrub habitat (USDA 2011).

Approximately 90 percent of the soils on Carlton Pond WPA are poorly drained. Besides a large area of open water, the dominant soil type is the very poorly drained Borosaprists (ponded). The primary well-drained soil is the Thorndike-Winnecook complex (USDA 2011).

Air Quality

The Penobscot Indian Nation monitoring station, located in Penobscot County on the Penobscot Indian Nation Reservation and adjacent to the Sunkhaze Meadows Unit, is the only air quality monitoring station near any Sunkhaze Meadows NWR and Carlton Pond WPA properties. The Penobscot Indian Nation monitoring station monitors ozone levels hourly.

Ozone levels are low in the winter and peak in the summer months. The current National Ambient Air Quality Standard (NAAQS) for ozone is 0.075 parts per million (ppm). A monitoring station experiences an ozone exceedance when the 8-hour ozone average exceeds the current standard. Table 2.1 presents the ozone exceedance incidents for the Penobscot Indian Nation station from 2006 to 2011.

Table 2.1. Ozone Exceedance Days, Penobscot Indian Nation Monitoring Station, Penobscot County, 2006 through 2011 (ME DEP 2011)

Year	Number of Exceedance Days, State of Maine	Number of Exceedance Days at Penobscot Indian Nation	Ozone PPM Level	Date(s) of Exceedance Days at Penobscot Indian Nation Monitoring Station
2011	3	0	--	n/a – not applicable; no exceedance days recorded
2010	8	0	--	n/a
2009	3	0	--	n/a
2008	4	0	--	n/a
2007	14	2	0.080; 0.080	4/23/07; 5/25/07
2006	11	1	0.077	5/15/06

Given that ozone levels around the refuge continue to be well below the State's overall number of exceedance days, there appears to be no ozone-related air quality issues at the Sunkhaze Meadows Unit.

Particulate Pollution

While particulate pollution can occur throughout the year, it peaks in the summer, due mainly to wildfires, and in the winter, primarily from wood smoke (EPA 2011). Wood burning is one of the largest sources of particulate and toxic air pollution in Maine. Wood smoke can contain nitrogen oxides, carbon monoxide, and organic gases in addition to particulate matter pollution (MDEP 2011b).

During the winter months wood smoke contributes to higher levels of particulate matter pollution in Maine, with pollution levels highest in the morning hours. Maine experiences a number of days with moderate levels of particulate matter pollution during the winter months, even when much of New England might have lower levels of particulate matter pollution. Wood smoke can cause harm to human health, particularly to the health of children, the elderly, and those with chronic conditions. It can also result in environmental and general neighborhood complaint issues (EPA 2011).

MDEP staff monitors particle pollution levels daily and provides data on recorded levels to the public in four ways:

- 24-hour toll free Air Quality hotline: 1-800-223-1196.
- Online at *http://www.maine.gov/dep/air/ozone/index.html*; accessed September 2012.
- EnviroFlash— Email and text message alert system established by EPA in cooperation with MDEP.
- Sharing information with local media.

When levels are elevated and expected to remain elevated, staff report the levels on the air quality hotline and the air quality forecast Web site. Whenever unhealthy concentrations are expected, staff issues an advisory message.

To report on daily air quality, U.S. EPA developed the air quality index (AQI). The AQIs purpose is to help citizens understand what local air quality means to their health. MDEP uses the AQI to report on particle and ozone levels. They take the measurements of concentrations of the major pollutants at locations throughout the State and then convert them into AQI values, with an AQI value calculated for each of the individual pollutants in an area.

For ozone, the AQI is based on ozone levels averaged over an 8-hour period; for particulates, it is based on particle pollution levels averaged over a 24-four hour period. Table 2.2 describes the AQI levels of health concern, including the index ranges and the color system used to represent each level.

Table 2.2. Overview of Air Quality Index Levels

AQI Levels of Health Concern	Color	Air Quality Index
Good	Green	0 to 50
Moderate	Yellow	51 to 100
Unhealthy for Sensitive Groups	Orange	101 to 150
Unhealthy	Red	151 to 200
Very Unhealthy	Purple	201 to 300

Adapted from http://www.airnow.gov/index.cfm?action=aqibasics.aqi

Environmental Contaminants

Two landfills near the Sunkhaze Meadows Unit pose potential concerns: the Fort James (formerly James River) Corporations sludge landfill along Stud Mill Road, and the town of Milford municipal landfill along County Road. The 27-acre Fort James landfill is located approximately 3,600 feet east of Buzzy Brook along the refuges northern boundary. The landfill was closed on December 1, 1996, and covered with a combination of soil, borrow, grit, and sand. Between 1979 and 1996, the landfill received sludge from paper mill operations, woody debris, lime, tire chips, and miscellaneous material. Twenty-one groundwater wells surround the landfill, two of which are located on the refuge. However, all required groundwater monitoring has been completed and these wells are no longer sampled. The potential for overland transport of contaminants from this landfill appears remote. No established surface water drainages appear to exist between Buzzy Brook and the landfill. However, there are borrow pit ponds on the refuge within approximately 850 feet of the landfill; groundwater flow direction is towards the borrow pit ponds.

The 5-acre Milford municipal landfill is located approximately 980 feet east of Baker Brook along the southern boundary of the refuge. The Milford landfill was closed in 1995. From 1976 to 1993 the landfill received municipal solid waste, demolition debris, white goods, tires, and household waste. The landfill is capped with an impermeable clay cover and a vegetative cover. Visual inspections by Service personnel in late February 1999 (an unusual period of minimal snow cover) did not indicate any sloughing, erosion, or breakouts on the cap. Groundwater monitoring wells are located around the landfill, but there are no monitoring wells on refuge property. The three existing wells are monitored biannually for State Closure Indicator parameters: hardness, chloride, chemical oxygen demand, iron, manganese, sodium, and sulfate (CES, Inc. 1998). The potential for overland transport of contaminants from the landfill appears remote. No established surface water drainages exist between Baker Brook and the northwest corner of the landfill. The floodplain of Baker Brook is less than 1,000 feet from the landfill, and it is possible that groundwater underlying the landfill discharges to the brook.

In 1993, a screening-level contaminant survey of the Sunkhaze Meadows Unit was conducted by the Service's Maine Ecological Services Office (Mierzykowski and Carr 2004). Elevated levels of polychlorinated biphenyls (PCBs) were found in a Baker Brook sediment sample (0.78 ppm) and high chromium levels were found in chain pickerel (10.59 ppm) and yellow perch (13.20 ppm) samples from Sunkhaze Stream. In 2001, a follow up contaminant survey was conducted using additional locations along these watercourses to validate the earlier results and to determine the extent of contamination in fish and sediments. The contaminants of concern in the

1993 collections were not found at elevated levels in the 2001 collections. In 2001, fish tissue samples from Sunkhaze Stream and Baker Brook did not contain detectable levels of PCBs or chromium. No other organochlorine compounds or inorganic elements were found at elevated concentrations in fish tissue during the follow-up study. PCBs were not detected in the five sediment samples from Baker Brook. Chromium was detected in Baker Brook sediments at low levels, but the element was not detected in any fish samples from the brook (Mierzykowski and Carr 2004).

Data collected in contaminant studies suggested that the former Milford municipal landfill, closed since 1995, may be influencing Baker Brook. Of the 21 inorganic elements identified during analysis, 10 elements exhibited their highest concentrations in the Baker Brook sediment collection site approximately one-half mile downstream of the former landfill. Of the 10 elements, however, only cadmium occurred at an elevated concentration (1.18 ppm) and at a level only slightly above the threshold effect concentration of 0.99 ppm. Arsenic was also found slightly above its threshold effect concentration (9.79 pp,), measuring 10.2 ppm at the confluence of Baker Brook and Sunkhaze Stream (Mierzykowski and Carr 2004).

The Service's Northeast Region has also participated in and coordinated its regional work with the National Abnormal Amphibian Project at various national wildlife refuges throughout the Northeast since 2000. Many amphibians (such as frogs and salamanders) are sensitive to a variety of environmental stresses, such as pollution, and may be good early indicators of the health of their environment. For this reason, the Service has had an interest in determining if amphibian abnormalities are occurring on national wildlife refuges. In their 2005 report, researchers summarized the results to date of the sampling effort conducted in 2005 as well as previous years' efforts extending back to preliminary efforts in 1997. As part of their investigation, the Service sampled frogs at Sunkhaze Meadows Unit and Carlton Pond WPA. Ongoing sampling was discontinued at Sunkhaze Meadows Unit due to small number of frogs collected and the lack of abnormalities found. A small percent (approximately 1 percent) of Carlton Pond frogs did exhibit some abnormalities (Pinkney et al. 2005). Some of these were the result of fungal infections to individuals. Other causes of abnormalities are unknown since the Carlton Pond watershed is known to be free of contaminant sites (Pinkney et al. 2005).

An underground natural gas pipeline (Maritimes and Northeast Pipeline) was constructed near the Sunkhaze Meadows Unit in the fall of 1999 and early spring 2000. The pipeline route runs along County Road, adjacent to the Sunkhaze Meadows Unit. This right-of-way crosses seven streams and tributaries that flow into the refuge. Limited surface water sampling along the pipeline corridor before and after construction detected no impacts to the refuge.

Two roads form more than half of the Sunkhaze Meadows Unit boundary: the northern and northeastern boundaries are bordered by Stud Mill Road, and County Road forms the southeastern boundary. Both roads are unpaved, typical of northern and eastern Maine. Stud Mill Road is a privately owned logging road, while County Road is maintained by the town of Milford. Vehicle traffic along these roadways is fairly constant throughout the year. Refuge staff has observed illegally dumped debris and refuse frequently along the roadways. Numerous roadside ditches, bridges, and culverts along the Stud Mill Road and County Road are potential pathways for vehicle-related or illegally disposed contaminants into the watercourses of

Sunkhaze Meadows Unit. In the early 1990s, the refuge worked with its neighbor, James River Corporation, to install five gates on refuge access points to help curtail illegal dumping; the gates had a positive effect in controlling dumping.

No contaminants are known to impact the other refuge units or Carlton Pond WPA.

Refuge and WPA Biological Resources

Vegetation and Habitat Resources

In 2004, the Service contracted with the James W. Sewall Company to conduct aerial surveys and develop vegetation maps for several refuges in the Northeast, including Sunkhaze Meadows NWR and Carlton Pond WPA. Sewall delineated habitats based on the National Vegetation Classification Standard (NVCS, *http://biology.usgs.gov/npsveg/nvcs.html*; accessed September 2012). The Nature Conservancy and the Natural Heritage Network developed the NVCS as their standard system for classifying vegetation communities; the Service subsequently adopted this system to map habitats on refuges. This classification system is based on hierarchical levels so that it can be used on the finest or coarsest level as needed (Comer et al. 2003). This is useful since wildlife typically respond to coarser scale conditions rather than more fine-scale individual natural communities. Therefore, we combined several natural community types into broader habitat types to guide management objectives and strategies.

Sunkhaze Meadows Unit

Sunkhaze Meadows Unit is an ecologically diverse community dominated by an expansive freshwater wetland-peatland complex surrounded by a conifer-northern hardwood upland forest. The habitat types are listed in Table 2.3 and displayed on map 2.1.

Table 2.3. Sunkhaze Meadows Unit Habitat Types

Habitat Type	**Acres**
Freshwater Wetlands-Peatland Complex	
Freshwater Wetland	1,654
Open Water	158
Peatland	1,649
Forested Habitats	
Northern Hardwood-Mixed Forest	5,002
Conifer Forest	2,904
Young Forest	117
Total	**11,484**

Freshwater Wetland-Peatland Complex
The complex contains several large raised bogs or domes, separated by extensive areas of streamside freshwater meadows. Davis et al. (1983) ranked the peat bogs of the Sunkhaze Meadows Unit high quality among 31 other peatlands in Maine based on its developmental-morphological diversity, pristine character, and exemplary quality of peatland type or feature. It

is the second largest peatland in the State, with peat thickness ranging from 5 to 20 feet. The peat is typically underlain by 10 to 20 feet of silt and clay which in turn is underlain by 20 to 30 feet of glacial till over bedrock (MGS 2011).

Peatlands are a wetland type whose soils are "peat"—partially decayed remains of dead plants. Peatlands are described by topography (flat or level, on slopes, or raised) and are classified by their water and nutrient characteristics (Johnson 1985):

- *Minerotrophic* peatlands receive water primarily from underground or surface sources; has higher nutrient concentrations because the water picks up nutrients as it passes through soil and bedrock.
- *Ombrotrophic* peatlands receive their water from precipitation; lower nutrient concentrations.
- *Oligotrophic* peatlands are between the other two in nutrient richness.
- A *fen* is a strongly enriched (primarily minerotrophic) peatland, while a *bog* is a rain-fed (largely ombrotrophic) peatland.

The Northeast U.S. supports a range of peatland types, with many different types often occurring together in large peatland complexes (Johnson 1985).

The wetland-peatland complex is just part of the diverse mix of natural communities and habitats on this unit. An exemplary floodplain forest abuts the peatland, Sunkhaze Stream meanders through a portion of the bog, and the wetland complex is surrounded by mixed upland forest (see map 3.9). The Sunkhaze Meadow focus area description in the Maine Comprehensive Wildlife Conservancy Strategy, notes that the large unpatterned fen appears to provide outstanding habitat for peatland dragonflies and damselflies (MDIFW 2005). Bog bedstraw, a species of special concern in Maine, is found in the peatlands (MNAP 2010). Sunkhaze Meadows Unit is also identified as a statewide conservation priority focus area by MDIFW. These areas are "landscape scale areas that contain exceptionally rich concentrations of at-risk species and natural communities and high quality common natural communities, significant wildlife habitats, and their intersection with large blocks of undeveloped habitat" (MDIFW 2008a).

In August and September 1996, Famous and Famous (1997) sampled the following plant communities across environmental gradients from Sunkhaze Stream to the open bog. Their report also lists the dominant plant species found in each community type and provides recommendations for future vegetation sampling.

Rooted aquatic:	A narrow zone along the streams, always inundated but shallow enough for abundant cover of aquatic vascular plants to be present; water depth may vary; minerotrophic
Graminoid meadow:	A zone of varying width along streams, dominated by grasses and sedges; often flooded, especially seasonally; minerotrophic
Open fen:	Low shrubs (less than 1 meter); dominance by minerotrophic species, wide variety of herbaceous species; some sedge and/or sphagnum peat accumulation

Shrub fen: Shrubs taller than open fen, averaging 1 to 2 meters; sphagnum more abundant than open fen with peat accumulation; some tree species, but usually less than 2 meters tall; minerotrophic

Wooded fen: Shrubs 1 to 2 meters tall, tree species average 25 to 50 percent cover; sphagnum abundant, peat accumulation; minerotrophic

Dwarf shrub heath: Dominance of ericaceous shrubs, less than 1 meter tall; close to 100 percent sphagnum cover and well developed hummocks; thick peat layer; ombrotrophic

Wooded shrub heath: Dominance by ericaceous shrubs, but 25 to 50 percent cover by tree species; sphagnum close to 100 percent, well developed hummocks; ombrotrophic

Forested bog: Dominated by black spruce (*Picea mariana*), possibly larch (*Larix laricina*), and ericaceous shrubs; sphagnum close to 100 percent cover, well developed hummocks; ombrotrophic

Peatland lagg: Narrow zone between ombrotrophic peatland and upland where water collects at the edge of a bog; characterized by robust shrubs and scattered trees, mostly ericaceous but supports other shrubs as well; variety of sedges and herbs possible; sphagnum cover usually high, but many other mosses may be present; minerotrophic

High rainfall during the summer of 1996, and as recent as 2005, flooded much of the meadow areas in this unit for most of the summer. This may have changed the species composition, at least temporarily. Although perennial herbaceous species were present, annual species may not have had ample opportunity to become established. Likewise, flowering and fruiting times for both annuals and perennials may have been interrupted, causing changes for the next growing season. It is most likely that yearly fluctuations in summer rainfall are an ongoing part of the ecology of this wetland complex (Famous and Famous 1997).

Sunkhaze Stream—The Sunkhaze Meadows Unit includes nearly 5 miles of Sunkhaze Stream and another 16 miles of tributary streams (map 2.1). Sunkhaze Stream and its tributaries (Buzzy, Little Buzzy, Baker, Dudley, and Johnson Brooks, Birch, and Little Birch Streams) support diverse wetland communities including wet sedge meadow, shrub thicket, cedar swamp, forested wetland, and open freshwater stream habitat. Sunkhaze Stream was described earlier in chapter 2 under the Hydrology and Water Quality subsection under Physical Landscape.

Habitat on the tributaries varies. Birch and Little Birch Streams have long, shallow riffle areas followed by shaded, deep, sand and gravel bottoms. Buzzy and Baker Brooks are similar to each other with lower reaches containing narrow, winding channels blocked by beaver dams (Smithwood and McKeon 1999).

Conifer- Northern Hardwood Mixed Forest—Sunkhaze Meadows Unit has 7,906 acres of forested upland habitat. Much of the forest was selectively harvested prior to refuge acquisition, creating age class and structural diversity. In the late 1970s and early 1980s, the State of Maine experienced a severe spruce budworm infestation and much of the balsam fir-red spruce overstory was removed from lands along the Stud Mill and County roads. The forest today is diverse, dominated by softwood tree species (red, white, and black spruce, balsam fir, hemlock, northern white cedar, eastern tamarack, eastern white, and red pine) with a mix of northern hardwoods (aspen species, paper birch, gray birch, red maple, silver maple, sugar maple, red and white oak, ash, and beech).

Northern hardwood-mixed forests and conifer forests at Sunkhaze Meadows Unit likely contain scattered vernal pool habitats. Vernal pools are small areas that seasonally fill with water in spring, but then dry out later in the year. These transient habitats provide ideal breeding and juvenile rearing habitat for a variety of amphibian species (Regosin et al. 2005, Rittenhouse and Semlitsch 2007).

At the southwestern part of the Sunkhaze Meadows wetland-peatland complex, the floodplain forest forms a narrow band along Sunkhaze Stream and is dominated by silver maple with some red maple. The Maine Natural Areas Program identified this approximately 100-acre floodplain forest as an exemplary natural community (MNAP 2010). Hardwood floodplain forests are classified as rare (S3) by the Maine Natural Areas Program (MNAP 2010), occurring in long and narrow floodplains or on islands of large rivers and streams throughout Maine and New England. Maine's remaining floodplain forests are generally more extensive than in other New England states. Most of the northern floodplain examples of this forest type were harvested or converted to agriculture.

Young Forest Early Successional Habitat—Early successional habitats (including young forests, shrublands, and grasslands) are created through some form of disturbance such as logging, clearing, fire, wind damage, or pest outbreaks. Young forest habitat contains a mix of trees and shrubs typically younger than 40 years old and often create dense, thick stands of vegetation. If left unmanaged, these habitats would eventually transition (or succeed) into more mature forested habitats.

An electric transmission corridor (power lines) transects the western portion of the refuge providing 107 acres of early successional habitat. This power line right-of-way is a deeded property right established prior to refuge acquisition. This young forest habitat is comprised largely of speckled alder, white ash, sweet gale, and other native tree and shrub species. Another 10 acres of young forest habitat is mapped within former log yards and small clearings at the Sunkhaze Meadows Unit, including 2 acres originally cleared for young forest early successional habitat management demonstration. This demonstration area is located near the Johnson Brook Trail.

Benton Unit

The 334-acre Benton Unit consists of 2 acres of freshwater marsh and open water, 96 acres of grassland, 155 acres of northern hardwoods-mixed forest, and 70 acres of conifer forest. The upland forests are a mix of sugar maple, ash, beech, white oak, and eastern white pine, and a few

stands of mature eastern white pine, spruce-fir, and on wetter ground, northern white cedar. The habitat types are listed in table 2.4 and displayed on map 2.2.

When this unit was a working farm, the fields were ditched to remove excess surface moisture. In 1993 the Service installed three dikes to plug some of these ditches to create small impoundments varying in size from 0.25 acres to over 2 acres as a wetland restoration project under the Service's Private Lands Initiative. Most of the Benton Unit drains into Fowler Brook, which then flows into the Sebasticook River. One stream segment on refuge lands goes through the center of the unit, primarily the grassland habitat. The other stream segment follows the eastern edge of the unit and is bordered by forest. The open fields are maintained through prescribed fire and annual haying. A local farmer is currently permitted to mow approximately 72 acres of the fields each year. Mowing occurs after mid-July, to avoid disturbing grassland-nesting birds.

Table 2.4. Benton Unit Habitat Types

Habitat Type	**Acres**
Northern Hardwoods- Mixed Forest	155
Conifer Forest	70
Grassland	96
Sedge Meadow and Open Marsh	13
Total	**334**

Sandy Stream Unit

The 58-acre Sandy Stream Unit is mainly comprised of upland shrubland and floodplain forest. The habitat types are listed in table 2.5 and displayed on map 2.3. The shrubland was hydro-axed in 1995, and burned periodically in subsequent years to maintain a balance of open grass with a 30 to 50 percent open shrub component. Some of the Sandy Stream Unit was mapped as aspen-birch woodland forest by Sewall (2004); however, from a management perspective, this is considered part of the early successional-upland shrub habitat. A narrow band of floodplain forest is located along Sandy Stream; the floodplain forest widens at the north end of the Unit. A snowmobile trail, maintained by a local snowmobile club, bisects the shrubland habitat.

Table 2.5. Sandy Stream Unit Habitat Types

Habitat Type	**Acres**
Riparian Floodplain Forest	19
Upland Shrub	26
Grassland	13
Total	**58**

Carlton Pond Waterfowl Production Area

The 1,068-acre Carlton Pond WPA includes most of Carlton Pond, the surrounding freshwater wetlands, and several small areas of forested lowlands and uplands (see table 2.6 and map 2.4). Carlton Pond WPA was acquired by the Service in the mid-1960s. The original rock dam was built in 1850 to power a sawmill. It was reconstructed by the Service in 1972 to maintain the

integrity of the structure and to allow for continued management of water levels using a water control structure (WCS). In partnership with Ducks Unlimited the Service repaired the WCS in 1996 to allow for more effective water level management. More than 84 percent of the site is open water or shallow freshwater marsh. The remaining 16 percent is forested, dominated by aspen, red and sugar maple, box elder, paper birch, and eastern white pine. At capacity the pond itself consists of approximately 295 acres of open water containing 1,198 feet of water. Emergent plants such as pickerel weed, pond lily, and water lilies are abundant. Surrounding the open water is a freshwater wetland with plants typical of a graminoid marsh, including leather-leaf, buttonbush, cranberry, sweet gale, and rhodora.

Table 2.6. Carlton Pond WPA Habitat Types

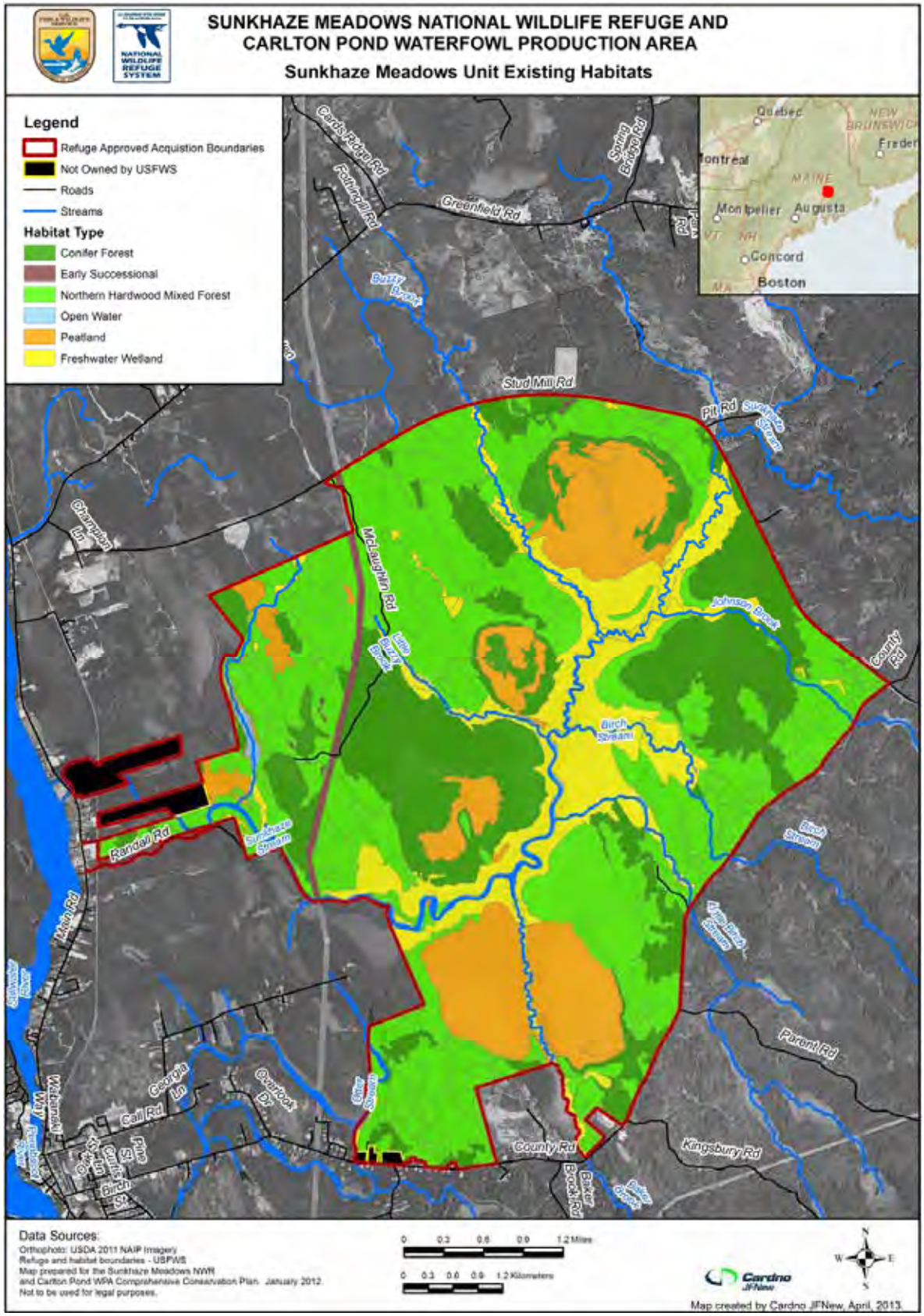
Habitat Type	**Acres**
Conifer Forest	45
Northern Hardwood- Mixed Forest	239
Freshwater Wetland	455
Peat Bog	34
Open Water	295
Total	**1,068**

Rare or Exemplary Natural Communities and Rare Plants

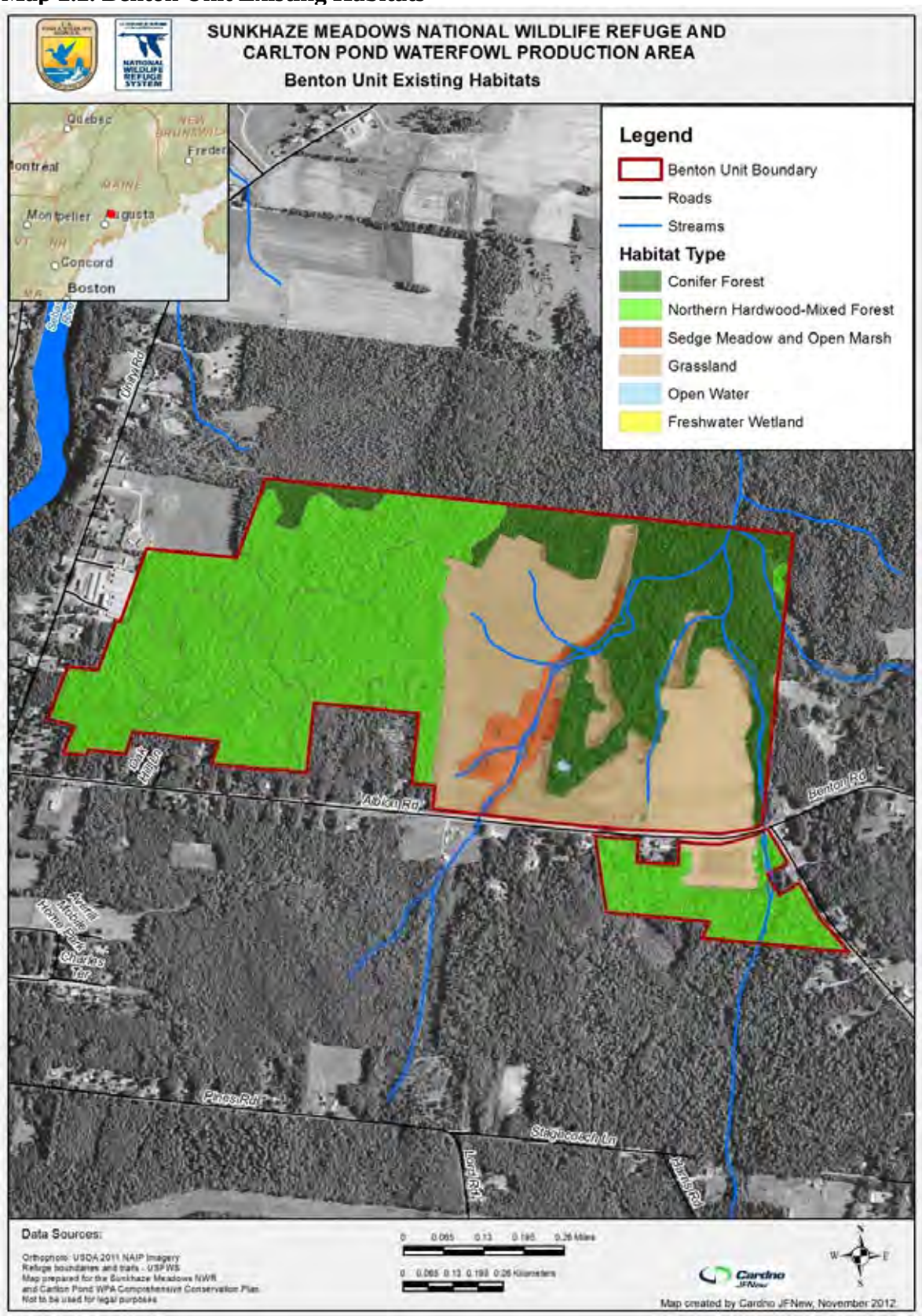
Exemplary Natural Communities

The Maine Natural Areas Program (MNAP) documented several exemplary natural communities and ecosystems on the Sunkhaze Meadows Unit (MNAP 1999). These include: unpatterned fen ecosystem, domed bog ecosystem, northern white cedar woodland fen, and silver maple floodplain forest. A field survey by MNAP staff in 2010 resulted in an updated map and description of the northern white cedar woodland fen, which was previously described as a northern white cedar seepage forest (MNAP 2010). Table 2.7 lists the rare or exemplary communities and ecosystems that are known to occur on the Sunkhaze Meadows Unit. See map 2.5 for their locations.

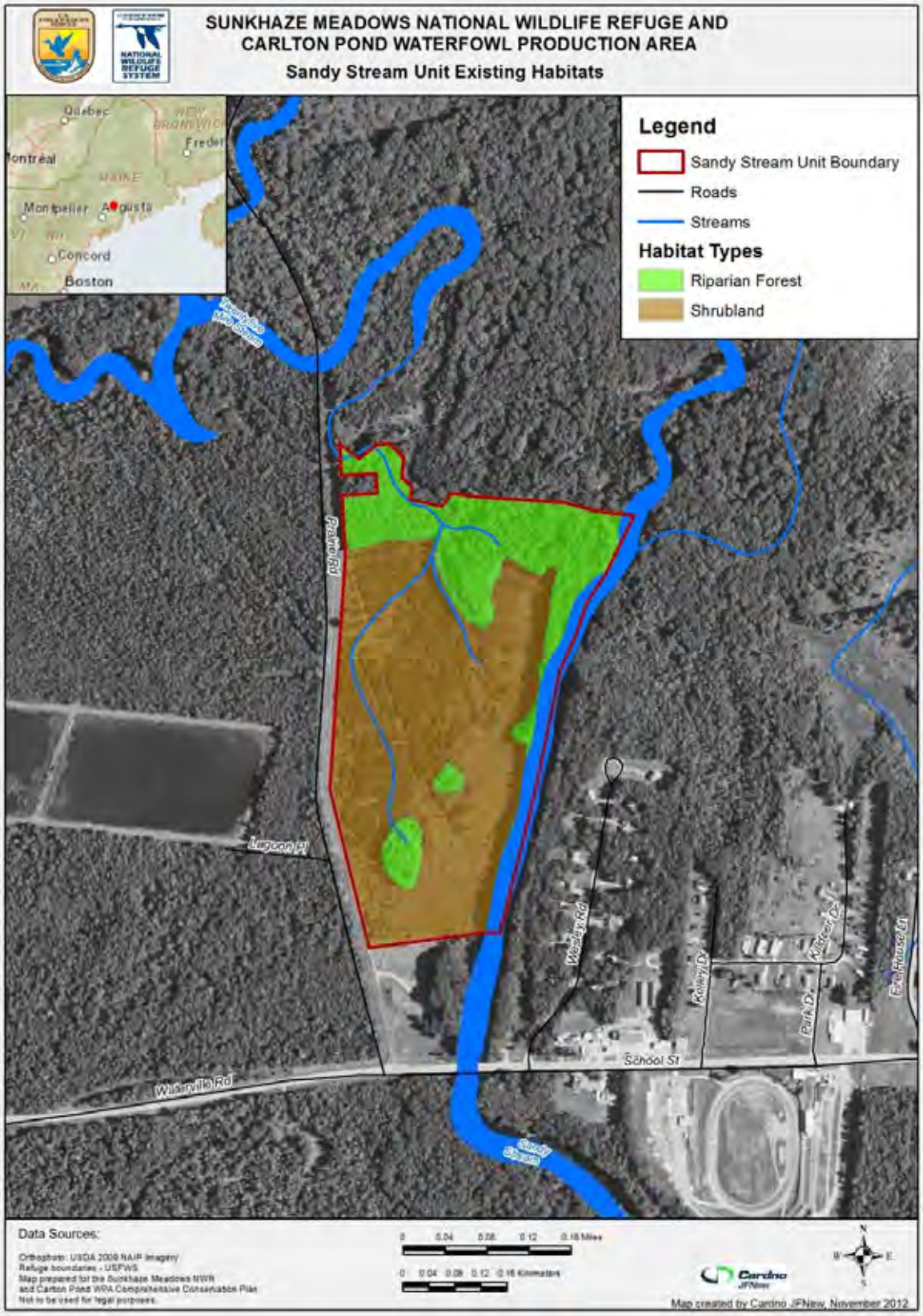
Map 2.1. Sunkhaze Meadows Unit Existing Habitats



Map 2.2. Benton Unit Existing Habitats



Map 2.3. Sandy Stream Existing Habitats



Map 2.4. Carlton Pond WPA Existing Habitats

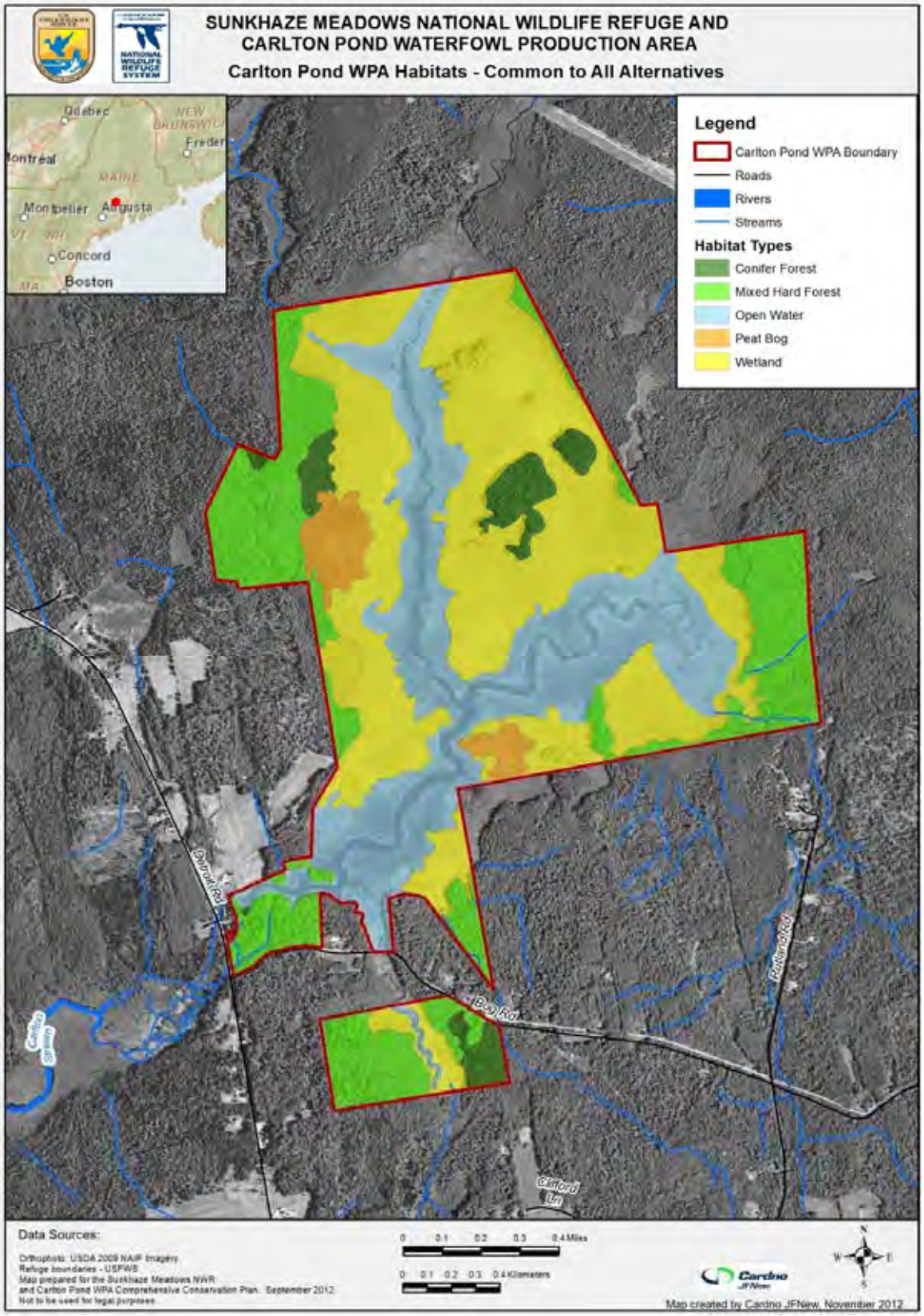


Table 2.7. Rare or exemplary natural communities and ecosystems on the Sunkhaze Meadows Unit.

Natural Community/Ecosystem/Plant	Approx Size (acres)	State Ranking
Unpatterned fen ecosystem[1]	6,855*	S5 – secure
Domed bog ecosystem	1,649	S3 -- uncommon
Northern white cedar woodland fen	390	S4 -- common, outstanding example
Silver maple floodplain forest	100	S3 -- uncommon

** Of this total, 5,949 acres of unpatterned fen ecosystem are located within the refuge boundaries.*

The 6,855-acre unpatterned fen ecosystem extends beyond the refuge boundaries, although most of it (5,949 acres) lies within the Sunkhaze Meadows Unit. Unpatterned fen ecosystems are peatlands in which groundwater or water from adjacent uplands moves through the area (MNAP 2012). As a result, plants are exposed to more nutrients, and the vegetation is typically different and more diverse than that of bogs. The dominant vegetation includes sedges, grasses, reeds, and sphagnum (Gawler and Cutko 2010).

The domed bog ecosystem is comprised of a series of islands, at a slightly higher elevation than the surrounding unpatterned fen ecosystem. These island peatlands display a vegetation pattern that reflects a nutrient gradient from the higher center of the dome out to the lower edges of the island (Gawler and Cutko 2010).

The 390-acre northern white cedar woodland fen is embedded within the unpatterned fen ecosystem. According to MNAP, the woodland fen is a broad, flat peatland dominated by a canopy of northern white cedar, with a dense mix of rough-leaved alder, winterberry, and black ash. The cedar trees range from 4 inches to 23 inches (10cm to 60cm) diameter at breast height (dbh), with smaller diameter trees being much more common than larger ones. Cinnamon and royal ferns dominate the hummocky herb layer which includes a number of sedge species and a variety of forbs characteristic of this community type. Under the ferns, mixes of low growing sedges are common. Sphagnum and other mosses dominate the abundant hummocks, but hollows are largely unvegetated and often saturated. The MNAP also noted a small band of cedar-spruce seepage forest along the upland edge of the fen, although it was too small to map as a separate community (MNAP 2010).

The MNAP also documented a 100-acre exemplary silver maple floodplain forest along Sunkhaze Stream, from 0.25 miles upstream of the power line and continuing upstream approximately 1.5 miles on both sides. Although not the highest quality, the forest is well buffered and protected within the refuge. Hardwood floodplain forest is usually dominated by widely spaced and multi-trunk silver maple. The understory is usually sparse with few shrubs, a result of annual ice scouring. By early summer the forest floor is often lush with herbaceous plants including spring ephemerals such as trout lily and ferns. High nutrient levels in the soil are

maintained through seasonal deposition of nutrient-rich sediments as a result of seasonal flooding (MNAP 1999).

No exemplary or rare natural communities or ecosystems are documented for the other refuge units or WPA.

Rare Plants

Two rare plant species are documented on the Sunkhaze Meadows Unit. A population of State-listed, threatened showy lady's slipper (*Cypripedium reginae*) is documented in the northern white cedar woodland fen in Sunkhaze Meadows Unit (MNAP 2011). Bog bedstraw (*Galium labradoricum*), a State species of concern, was documented in 1995 for this unit, although the population has not been re-surveyed since then (MNAP 1998). Two other rare species – slender blue flag iris (*Iris prismatica*, State-listed, threatened) and wild garlic (*Allium canadense*, Maine species of concern) are listed as occurring on the Sunkhaze Meadows Unit in earlier Service documents (e.g., USFWS 2001); however, these species are not in the MNAP database and are likely historical records (Don Cameron, MNAP, personal communication 2011). No other rare plant species have been documented on the other refuge units or at the WPA.

Invasive Plant Species

The Service identifies an invasive species as a species that is (1) nonnative to the ecosystem under consideration, and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Invasive plant species are recorded for Sunkhaze Meadows and Benton Units and Carlton Pond WPA; no invasive plants have been detected at the Sandy Stream Unit (table 2.8).

In the early 1990s, an infestation of purple loosestrife was discovered on a portion of the Carlton Pond WPA. Refuge staff pulled loosestrife plants in 1993 and 1994, but concluded that the level of effort and cost to physically remove the infestation was not feasible. In subsequent years refuge staff has released biological control agents (*Galerucella pusilla*) to combat purple loosestrife at Carlton Pond WPA.

Refuge staff has slowly watched purple loosestrife spread along roadsides and in private wetland areas closer to the Sunkhaze Meadows Unit. Staff members and friends have been pulling 30 to 40 purple loosestrife plants here annually between July and August to prevent its spread onto the refuge. In 2011, the Friends of Sunkhaze hired a licensed pesticide applicator. With permission from appropriate land owners and assistance from refuge staff, loosestrife plants in the ditches along County Road were killed using a glyphosate-based herbicide approved for use in wetlands. The refuge paid for a treatment in 2012. Similar treatments may be necessary for a number of years to successfully control new plants arising from the seedbed. Two groups of loosestrife were also discovered in the Sunkhaze Meadows Unit along Sunkhaze Stream south of Ash Landing in 2011. These were dug up and removed.

Map 2.5. Exemplary Communities and Mapped Deer Yard at Sunkhaze Meadows Unit

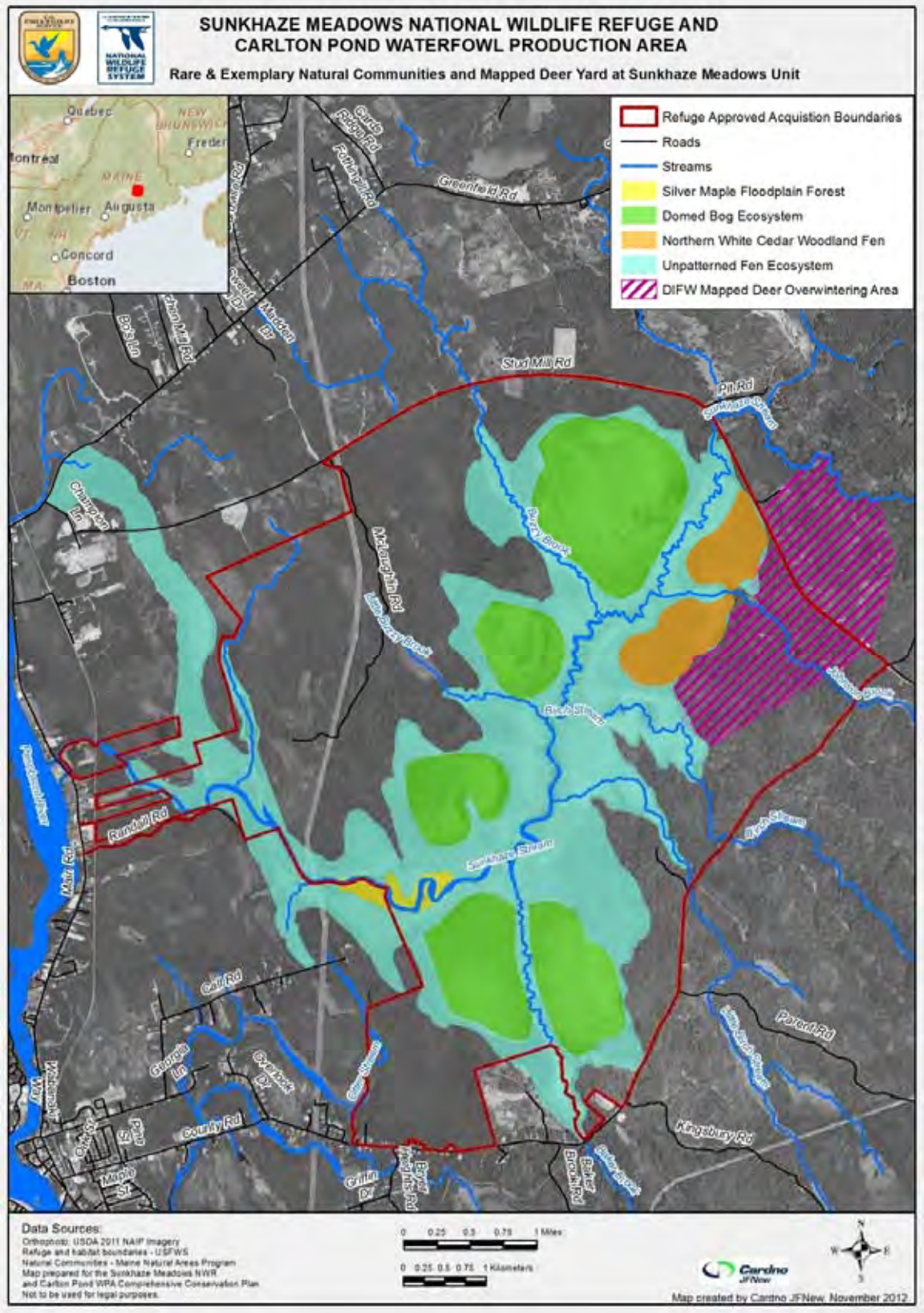


Table 2.8. Invasive Plants Detected on Sunkhaze Meadows NWR and Carlton Pond WPA.

Scientific Name	Common Name	Location
Cirsium arvense	Canada thistle	Benton Unit
Cirsium vulgare	Bull thistle	Sunkhaze Meadows Unit Benton Unit
Elaeagnus umbellate	Autumn-olive	Benton Unit
Fallopia japonica	Japanese knotweed	Sunkhaze Meadows Unit
Lonicera tatarica	Tartarian honeysuckle	Benton Unit
Lythrum salicaria	Purple loosestrife	Sunkhaze Meadows Unit; Benton Unit; Carlton Pond WPA
Rhamus cathartica	Common buckthorn	Sunkhaze Meadows Unit Carlton Pond WPA
Tussilago farfara	Coltsfoot	Sunkhaze Meadows Unit

Fish and Wildlife Resources

Table 2.9 lists the number of species by taxa that have been recorded on Sunkhaze Meadows NWR and Carlton Pond WPA since 1990. Appendix A includes a complete list of the species observed across all refuge units and the WPA.

Table 2.9. Summary of Species Detected by Taxa on Sunkhaze Meadows NWR and Carlton Pond WPA, 1990 to 2005. Numbers compiled from available refuge inventory summary data.

	Sunkhaze Meadows Unit	**Sandy Stream Unit**	**Benton Unit**	**Carlton Pond WPA**
Fish and Wildlife				
Amphibians	17	12	16	12
Birds	202	66	98	96
Fish	21	19	1	29
Invertebrates	121	11	26	55
Mammals	45	17	23	14
	Sunkhaze Meadows Unit	**Sandy Stream Unit**	**Benton Unit**	**Carlton Pond WPA**
Mollusks	5	4	1	4
Reptiles	10	2	4	4
Plants				
Plants	358	133	223	202
Fungi	22	1	2	7
TOTAL	**801**	**265**	**394**	**423**

Fish and Mussels

The Sunkhaze Meadows Unit provides habitat for both warmwater and coldwater fish species. Smithwood and McKeon (1999) compiled a list of 15 fish species as part of a Fisheries Management Plan. Included in this list are three interjurisdictional fish species: Atlantic salmon, American eel, and brook trout. Sunkhaze Stream and its tributaries are designated as critical habitat for the federally listed, endangered Atlantic salmon. This listing is described in more detail under the subsection, federally listed threatened or endangered species below.
Atlantic salmon has been reported entering the lower reaches of Sunkhaze Stream from the Penobscot River during warmer summer months. The Penobscot River is a major migratory pathway for Atlantic salmon and American eel, but numerous dams on the river impede upstream and downstream migration of these (and other) species. Brook trout and American eel are native to the Sunkhaze Stream system, while smallmouth bass were introduced sometime prior to the 1940s. Several other species have been documented on Sunkhaze Meadows since the 1999 study; a full list is in table 2.10.

The primary brook trout habitat on the refuge appears to be a reach of Sunkhaze Stream from Stud Mill Road extending 200 meters downstream. During warm periods of the year, brook trout appear to move farther upstream. Brook trout have also been found in Little Birch Stream. Nearly 40,000 brook trout were stocked into Sunkhaze Stream between 1940 and 1950, and another 500 were stocked in Sunkhaze and Birch Streams from 1974 to 1975, the last year that any fish were stocked in waters now encompassed by the refuge. The stocking period coincided with heavy fishing pressure, especially on brook trout (Smithwood and McKeon 1999).

A recent study of fish assemblages in the Penobscot River and some tributaries (Kiraly 2012) included sampling of Sunkhaze Stream. All of the species found in Sunkhaze Stream were warm water species. The dominant fish were golden shiner, brown bullhead, and pumpkinseed. Other species that were captured during the study included redbreast sunfish, yellow perch, chain pickerel, and common shiner.

The Benton and Sandy Stream Units and Carlton Pond WPA are also dominated by common, warm water fish species. Fish species diversity at these units is as follows: Benton Unit (1 species), Sandy Stream Unit (19 species), and Carlton Pond WPA (29 species). There are no known federally listed or State-listed fish species at any of these sites. Known species in these locations include: chain pickerel, yellow perch, bullheads, carp, golden shiner, and smallmouth and largemouth bass. Smallmouth and largemouth bass are not native to Maine (MDIFW 2001). According to MDIFW, there has been an increase of 47 percent in the number of lakes with one or more species of bass between 1980 and 2000 (MDIFW 2001). Chain pickerel are thought to be native only to southern Maine, and are therefore not considered native to these sites (MDIFW 2008). Based on the MDIFW (2008) assessment, abundance of chain pickerel is increasing; and, despite State efforts to limit the distribution of pickerel, the species distribution is also increasing (MDIFW 2008). Bullhead and yellow perch are also considered to be nonnative to these units (MDIFW 2002). A complete list of reported fish species at each site is included in table 2.10.

Table 2.10 Fish Species Observed at Sunkhaze Meadows NWR and Carlton Pond WPA

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
American Eel	*Anguilla rostrata*		X	X		X
American Shad	*Alosa sapidissima*					X
Atlantic Salmon	*Salmo salar*	FE	X			
Banded Killifish	*Fundulus diaphanus*					X
Black Crappie	*Pomoxis nigromaculatus*					X
Blackchin Shiner	*Notropis heterodon*					X
Blacknose Dace	*Rhinichthys atratulus*		X	X		X
Blackspotted Stickleback	*Gasterosteus wheatlandi*					X
Blueback Charr	*Salvelinus alpinus oquassa*					X
Bridle Shiner	*Notropis bifrenatus*	ME SC				X
Brook Trout	*Salvelinus fontinalis*		X	X	X	
Brown Bullhead	*Ameriurus nebulosus*		X			X
Brown Trout	*Salmo trutta*		X	X		X
Burbot (Cusk)	*Lota lota*		X	X		X
Carp	*Cyprinus carpio*			X		X
Chain Pickerel	*Esox niger*		X	X		X
Common Shiner	*Luxilus Cornutus*		X	X		X
Creek Chub	*Semotilus atromaculatus*		X	X		X
Eastern Silvery Minnow	*Hybognathus regius*		X	X		X
Emerald Shiner	*Notropis atheinoides*			X		X
Fallfish	*Semontius corporalis*		X	X		X
Fathead Minnow	*Pimephales promelas*			X		X
Fourspine Stickleback	*Apeltes quadracus*			X		X
Golden Shiner	*Notemigonus crysoleucas*		X	X		X
Largemouth Bass	*Micropterus salmoides*					X
Ninespine Stickleback	*Puntitius puntitius*		X			
Northern Pike	*Esox lucius*					X
Pearl Dace	*Semotilus margarita*			X		

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
Pumpkinseed Sunfish	*Lepomis gibbosus*		X	X		X
Redbelly Dace	*Phoxinus eos*		X			
Redbreast Sunfish	*Lepomis auritus*		X			X
Smallmouth Bass	*Micropterus dolomieui*		X	X		X
Spottail Shiner	*Notropis hudsonius*		X			
White (Common) Sucker	*Catostromus commersonni*		X	X		X
Yellow Perch	*Perca flavescens*		X			X

**FE stands for federally listed, endangered. The ME SC status indicates species that are listed as Special Concern by MDIFW. These species have no special legislative protection. However, they are believed to be vulnerable and could become threatened or endangered because of factors such as their distribution, low or declining populations, or specialized habitat needs.*

A handful of mussels have been found on or near refuge property as well (table 2.11). These include two State-listed, threatened freshwater mussels documented in Sandy Stream, just off refuge property: the tidewater mucket and the yellow lampmussel.

Table 2.11 Mussel Species Observed at Sunkhaze Meadows NWR and Carlton Pond WPA

Common Name	Scientific Name	Status*	Sunkhaze Meadows Units	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
Eastern Elliptio	*Elliptio complanata*		X			X
Eastern Lampmussel	*Lampsilis radiata radiata*		X	X		X
Eastern Pearlshell	*Margaritifera margaritifera*		X			
Tidewater Mucket	*Leptodea ochracea*	ME T		X		
Yellow Lampmussel	*Lampsillis cariosa*	ME T/ FSC		X		

**ME T indicates Maine State-listed, threatened. FSC stands for Federal species of concern. This indicates species that are listed as Special Concern by USFWS. These species have no special legislative protection; however, they are believed to be vulnerable and could become threatened or endangered because of factors such as their distribution, low or declining populations, or specialized habitat needs.*

Birds

According to the Atlas of Breeding Birds of Maine (Adamus 1987), approximately 130 species of birds— resident and migratory—are possible, probable, or confirmed breeders in the vicinity of Sunkhaze Meadows Unit. The wetland-peatland complex is particularly valuable to songbirds during their spring and fall migration (Adamus 1987). Sixteen waterfowl species have been observed at Sunkhaze Meadows Unit, of which seven are known to breed there: wood duck, black duck, mallard, blue-winged and green-winged teals, ring-necked duck, and hooded merganser (USFWS 2008b). The wood duck and hooded merganser nest in tree cavities. Black ducks are the most common waterfowl species on the refuge in the fall (USFWS 2008b).

Other bird highlights for Sunkhaze Meadows Unit include breeding American and least bitterns and Virginia and sora rails, 23 species of breeding warblers, and documented nesting of spruce grouse, ruffed grouse, and wild turkey. Several shorebird species use the refuge during migration, while killdeer, spotted sandpiper, common snipe, and American woodcock breed there (appendix A).

Twenty-one species of raptors have been documented on the Sunkhaze Unit (USFWS 2008b) including: hawks, falcons, and owls. Ten of these are known to breed on the refuge: osprey, bald eagle, northern harrier, sharp-shinned hawk, northern goshawk, red-shouldered hawk, broad-winged hawk, great horned owl, barred owl, and northern saw-whet owl (appendix A).

Several bird species of concern are known to breed on the Sunkhaze Meadows Unit, including American woodcock, bay-breasted warbler, American black duck, Canada warbler, wood thrush, eastern wood-pewee, chestnut-sided warbler, blackburnian warbler, and black-throated-blue warbler, among others. Bald eagles are commonly seen foraging on this unit and were first observed nesting here in 2005.

Many of the birds observed at the Benton Unit were observed during migration. For example, several shorebird species were observed during spring or fall migration, including greater yellowlegs, killdeer, upland sandpiper, and American woodcock. Red-winged blackbird and tree swallow nest in or near the emergent wetland and sedge meadow. Sedge wrens documented at this site when the unit was first acquired by the Service have not been reported since that time. The grassland habitat is maintained to support nesting grassland birds, specifically bobolink.

The two main habitat types on the Sandy Stream Unit—shrubland and floodplain forest—support breeding bird species associated with these habitats. Shrub-nesting species include eastern kingbird, willow flycatcher, yellow warbler, common yellowthroat, field sparrow, and American goldfinch. Birds associated with the floodplain forest include pileated woodpecker, hairy woodpecker, yellow-bellied sapsucker, red-eyed vireo, and veery.

Carlton Pond WPA is one of the few wetlands in Maine used by nesting black terns, a State-listed, endangered species. The black tern population in Maine has been annually monitored since 1990, reporting between 80 and 90 pairs. The MDIFW manages black tern habitat by maintaining stable water levels in impoundments, taking efforts to deter predators, and using floating nest platforms (MDIFW 2013c). Other species that use the WPA for breeding, nesting,

feeding, or migration include American black ducks, hooded mergansers, common goldeneyes, Canada geese, wood ducks, blue-winged teal, ring-necked ducks, and other waterfowl, osprey, and several species of migratory song birds. Wood duck nest boxes were installed and are now maintained by volunteers.

Mammals

Forty-four species of mammals are documented for the Sunkhaze Meadows Unit (USFWS 2008b), including six species of shrews and moles, eight species of bats, eight species of the weasel family, many other species of small mammals, and an array of medium to large mammals including black bear, white-tailed deer, moose, bobcat, coyote, red and gray fox, and muskrat. Beaver are especially abundant along Sunkhaze Stream and its tributaries, as evidenced by their lodges, dams, caches, and scent mounds. MDIFW considers most furbearer populations to be stable in this part of the State; however, there are concerns over declines in fisher and bobcat harvests between 2008 and 2012 (DePue 2013 personal communication). MDIFW is also concerned about the over-harvest of river otters in this area (DePue 2013 personal communication).

A portion of the Sunkhaze Meadows Unit is part of a 1,129-acre deer wintering area. The deer wintering area extends throughout some of the eastern portion of the refuge and across the Stud Mill Road to the northeast. The mix of mature conifer, northern white cedar, and northern hardwood-mixed forest provides protection from severe weather and winter food sources for deer, which are at their northern limits of their range in Maine. The Benton Unit forest is part of a 435-acre deer wintering area that extends into the northeast corner of the unit.

The Benton Unit and Sandy Stream Unit report 23 and 17 mammal species, respectively. Moose, white-tailed deer, river otter, raccoon, woodchuck, and eastern chipmunk occur on both units. A mix of other small and medium sized mammals is reported from these two units (table 2.12).

Fifteen mammal species are reported for Carlton Pond WPA, including beaver, muskrat, river otter, and moose in the aquatic habitats. Other mammals include black bear, white-tailed deer, coyote, red fox, raccoon, woodchuck, ermine, chipmunk, and red and gray squirrels. For a full listing of all known mammal species at the different sites, see table 2.12.

We do not have estimates of mammal abundance for refuge or WPA lands. Statewide, status of mammal populations varies. According to the MDIFW, the State’s deer population has increased since the early 1980s to about 255,000 wintering deer. Deer abundance in central and southern Maine range from 15 to 25 deer per square mile (MDIFW 2013). However, recently deer populations in Maine have been declining (MDIFW 2011). White-tailed deer are near their northern range limit in Maine and are not well adapted for harsh winter conditions (Jakubus 1999). Consequently, winter severity is considered to be the greatest contributor to deer mortality in Maine (MDIFW 2011). Statewide, furbearer populations (e.g., beaver, mink, otter, and muskrat) are thought to be stable or increasing, with the exception of fisher and marten (M. Caron, personal communication 2013).

Table 2.12. Mammal Species Observed at Sunkhaze Meadows NWR and Carlton Pond WPA.

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
Beaver	*Castor canadensis*		X	X	X	X
Big Brown Bat	*Eptesicus fuscus*	ME SC	X			
Black Bear	*Ursus americanus*		X		X	X
Bobcat	*Lynx rufus*		X			
Coyote	*Canis latrans*		X		X	X
Deer Mouse	*Peromyscus maniculatus*		X	X		
Eastern Chipmunk	*Tamias striatus*		X	X	X	X
Eastern Gray Squirrel	*Sciurus carolinensis*		X		X	X
Eastern Mole	*Scalopus aquaticus*			X		
Fisher	*Martes pennanti*		X		X	
Gray Fox	*Urocyon cinereoargenteus*		X			
Hoary Bat	*Lasiurus cinerues*	ME SC	X			
Keen Myotis	*Myotis keeni*		X			
Least Weasel	*Mustela rixosa*		X			
Little Brown Myotis	*Myotis lucifugus*	ME SC	X			
Long-tailed Shrew	*Sorex dispar*		X			
Long-tailed Weasel	*Mustela frenata*		X			
Marten	*Martes americana*		X			
Masked Shrew	*Sorex cinereus*		X	X	X	
Meadow Jumping Mouse	*Zapus hudsonius*		X	X	X	
Meadow Vole	*Microtus pennsylvanicus*		X	X	X	
Mink	*Mustela vison*		X			
Moose	*Alces alces*		X	X	X	X
Muskrat	*Ondatra zibethicus*		X		X	X
Northern Flying Squirrel	*Glaucomys sabrinus*		X	X	X	
Northern Short-tailed Shrew	*Blarina brevicauda*		X	X	X	
Northern Water Shrew	*Sorex plaustris*		X	X		
Porcupine	*Erethizon dorsatum*		X		X	

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
Pygmy Shrew	*Sorex hoyi*		X			
Raccoon	*Procyon lotor*		X	X	X	X
Red Bat	*Lasiurus borealis*	ME SC	X			
Red Fox	*Vulpes vulpes*		X			X
Red Squirrel	*Tamiasciurus hudsonicus*		X		X	X
River Otter	*Lutra canadensis*		X	X	X	X
Short-tailed Weasel (Ermine)	*Mustela erminea*		X			X
Silver-haired Bat	*Lasionycteris noctivagans*	ME SC	X			
Smoky Shrew	*Sorex fumeus*		X		X	
Snowshoe Hare	*Lepus americanus*		X		X	X
Southern Bog Lemming	*Synaptomys cooperi*		X			
Southern Redback Vole	*Clethrionomys gapperi*		X	X	X	
Star-nosed Mole	*Condylura cristata*		X			
Striped Skunk	*Mephitis mephitis*		X	X	X	
White-footed Mouse	*Peromyscus leucopus*		X			
White-tailed Deer	*Odocoileus virginianus*		X	X	X	X
Woodchuck	*Marmota monax*		X	X	X	X

**The ME SC status indicates species that are listed as Special Concern by MDIFW. These species have no special legislative protection. However, they are believed to be vulnerable and could become threatened or endangered because of factors such as their distribution, low or declining populations, or specialized habitat needs*

Reptiles and Amphibians

As shown in tables 2.13 and 2.14, Sunkhaze Meadows NWR and Carlton Pond WPA support many amphibians and reptiles. A majority of these are frogs and salamanders. A Unity College student conducted an amphibian study at the Benton Unit and reported 10 amphibian species and 2 reptile species (Bishop et al. 1996). Seventeen amphibian species are reported from all three Sunkhaze Meadows NWR units and Carlton Pond WPA as listed in table 2.14. Three amphibian species of special concern in Maine are reported: blue-spotted salamander (Sunkhaze Meadows Unit, Sandy Stream Unit, Benton Unit) and leopard frog (Sunkhaze Meadows Unit, Sandy Stream Unit, Carlton Pond WPA). Wood turtle, a species of special concern in Maine, is reported from Sunkhaze Meadows Unit, Sandy Stream Unit, and Carlton Pond WPA.

Table 2.13. Reptile Species Observed at Sunkhaze Meadows NWR and Carlton Pond WPA.

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
Common Musk Turtle	*Sternotherus odoratus*	ME SC				
Common Snapping Turtle	*Chelydra serpentina*		X	X		X
Eastern Garter Snake	*Thamnophis sirtalis*		X		X	X
Eastern Painted Turtle	*Chrysemys picta*		X			X
Milk Snake	*Lampropeltis triangulum*		X			
Northern Brown Snake	*Storeria dekayi*	ME SC	X			
Northern Redbelly Snake	*Storeria ocipitomaculata*		X		X	
Northern Ribbon Snake	*Thamnophis sauritus*	ME SC	X		X	
Northern Ringneck Snake	*Diadophis punctatus edwardsii*		X		X	
Smooth Green Snake	*Liochlorophis vernalis*		X			
Wood Turtle	*Glyptemys insculpta*	ME SC	X	X		X

**The ME SC status indicates species that are listed as Special Concern by MDIFW. These species have no special legislative protection. However, they are believed to be vulnerable and could become threatened or endangered because of factors such as their distribution, low or declining populations, or specialized habitat needs.*

Table 2.14. Amphibian Species Observed at Sunkhaze Meadows NWR and Carlton Pond WPA.

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
American Toad	*Bufo americanus*		X	X	X	X
Blue-spotted Salamander	*Ambystoma laterale*		X	X	X	
North American bullfrog	*Rana catesbeiana*		X	X	X	X
Red-spotted Newt	*Notophthalmus viridescens*		X	X	X	X

Common Name	Scientific Name	Status*	Sunkhaze Meadows Unit	Sandy Stream Unit	Benton Unit	Carlton Pond WPA
Four-toed Salamander	*Hemidactylium scutatum*	ME SC	X		X	
Gray Tree Frog	*Hyla versicolor*		X	X	X	X
Green Frog	*Rana clamitans*		X	X	X	X
Mink Frog	*Rana septentrionalis*		X	X	X	X
Northern Dusky Salamander	*Desmognathus fuscus*		X	X	X	
Northern Leopard Frog	*Rana pipiens*	ME SC	X	X	X	X
Red-backed Salamander	*Plethodon cinereus*		X	X	X	
Spring Peeper	*Hyla crucifer*		X	X	X	X
Spring Salamander	*Gyrinophilus porphyriticus*	ME SC	X	X	X	
Northern Two-lined Salamander	*Eurycea bislineata*		X		X	X
Pickerel Frog	*Rana palustris*		X		X	X
Spotted Salamander	*Ambystoma maculatum*		X	X	X	X
Wood Frog	*Rana sylvatica*		X	X	X	X

**The ME SC status indicates species that are listed as Special Concern by MDIFW. These species have no special legislative protection. However, they are believed to be vulnerable and could become threatened or endangered because of factors such as their distribution, low or declining populations, or specialized habitat needs.*

Invertebrates, Excluding Mussels

According to refuge records, a large number (121 species) of invertebrates have been inventoried at the Sunkhaze Meadows Unit, a majority of which are butterflies, moths, dragonflies, and damselflies. This includes two species of special concern in Maine: tomah mayfly and pygmy snaketail dragonfly. As expected, fewer invertebrate species are documented for the Benton and Sandy Stream Units (26 and 12 species, respectively), and Carlton Pond WPA (55 species). Carlton Pond WPA is dominated by dragonflies, damselflies, and butterflies. The Benton and Sandy Stream Units have a mixed diversity of invertebrates including butterflies, crickets, mosquitoes, and bees.

Nonnative, Invasive Wildlife Species

While there are several nonnative fish species that occur in refuge and WPA waters, these are not considered to be invasive by MDIFW in these locations. No other nonnative wildlife species are known to occur on Sunkhaze Meadows NWR or Carlton Pond WPA..

Federally Listed Threatened or Endangered Species

Sunkhaze Stream and its tributaries are also designated as critical habitat for the federally listed, endangered Atlantic salmon. In 2009, the Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon was listed as an endangered species pursuant to the Endangered Species Act (ESA). The Gulf of Maine Atlantic salmon population was divided into three separate Salmon Habitat Recovery Units (SHRU), located in the Penobscot, Merrymeeting, and Downeast watersheds of Maine. The Atlantic salmon is an anadromous species, i.e., it relies on both freshwater and marine environments to complete its life cycle. Each phase of the life cycle (i.e. egg, juvenile, adult) is marked by distinct physical changes and habitat needs (Kircheis and Liebich 2007). Sunkhaze Stream was evaluated for its contribution to potential habitat for Atlantic salmon as part of the 2009 designation of critical habitat for Atlantic salmon (NMFS 2009). This watershed-scale analysis was based on the quantity and quality of Atlantic salmon migrating, spawning, and juvenile rearing habitat needs. As part of this analysis, Sunkhaze Stream was determined to be within the Critical Habitat Area for Atlantic salmon. However, it did rank low for habitat availability when compared to other streams within the watershed. Sunkhaze Stream's primary contribution to Atlantic salmon is likely as a cool water refuge. Spawning adults typically return to spawning waters early and find short-term cold water refuge in streams (e.g., deep pools, springs, and mouths of smaller tributaries) during the summer months before spawning in October and early November (Baum 1997).

While not included as critical habitat for Atlantic salmon, the Benton Unit, Sandy Stream Unit, and Carlton Pond WPA are also located within the GOM DPS for this species.

The Service is currently reviewing the status of the American eel as a potential candidate for listing under the Endangered Species Act. The American eel is native to the Sunkhaze Stream system and was documented on the unit in Birch Stream, one of the tributaries.

Although recently delisted from the Federal list, bald eagles are still protected under the Bald and Golden Eagle Protection Act. They are also still listed as State threatened by MDIFW.

No other federally endangered or threatened species are known to occur on other units of Sunkhaze Meadows NWR or Carlton Pond WPA.

State-listed Species

State-listed, threatened or endangered wildlife species are described in more detail in the previous section. Below is a summary table of State-listed species documented on the refuge or WPA (see table 2.15).

Table 2.15. State-listed, Threatened and Endangered Species Documented on Sunkhaze Meadows NWR and Carlton Pond WPA.

Common name	Scientific Name	Status	Division
Black tern	*Chlidonias niger*	State endangered	Carlton Pond WPA
Least bittern	*Ixobrychus exilis*	State endangered	Sunkhaze Meadows Unit and Carlton Pond WPA
Sedge wren	*Cistothorus platensis*	State endangered	Benton Unit
Tomah mayfly	*Siphlonisca aerodromia*	State threatened	Sunkhaze Meadows Unit
Pygmy snaketail dragonfly	*Ophiogomphus howei*	State threatened	Sunkhaze Meadows Unit
Tidewater mucket	*Leptodea ochracea*	State threatened	Sandy Stream Unit
Yellow lampmussel	*Lampsilis cariosa*	State threatened	Sandy Stream Unit

Wildlife Trends and Changes

While some species such as alpine plants have been in Maine for 10,000 years or more, the region also supports recent arrivals, such as coyotes, which appeared in the last 75 years. The majority of change to the area occurred over the last 400 years, significantly altering the landscape that was previously there (Foss 1992).

The 1800s witnessed the demise of many forest wildlife species from loss of habitat due to forest clearing, bounty and market hunting, millinery trade, and natural history specimen collecting (Foster et al. 2002). Heath hen, passenger pigeon, great auk, Labrador duck, and sea mink became extinct because of humans during the same period (DeGraaf and Yamasaki 2001, Foster et al. 2002).

Mountain lion, gray wolf, elk, and caribou were extirpated by the mid-1800s or early 1900s in Maine, and only the gray wolf has recently returned to New England. Two wolves were documented in Maine in the 1990s, although there has been no evidence of a breeding population. Lynx have returned to northern Maine.

In contrast, grassland species such as meadowlark, bobolink, upland sandpiper, woodchuck, and meadow vole increased as hayfields and pastures expanded during the early 19th century (Foss 1992, Foster and Motzkin 2003). Open land plant and animal species reached their peak abundance in the mid-1800s. The historical record is unclear on the abundance and distribution of these species prior to the surge in farming. DeGraaf and Yamasaki (2001) and Foster and Motzkin (2003) suggest that open land species were opportunistic, expanding into large, newly cleared lands from small, scattered populations in the pre-settlement era. In a similar pattern, other species expanded their range into New England from the Midwest.

After farm abandonment escalated in the early 1900s, grassland habitats ebbed, while thickets, brush lands, and young forests surged (Litvaitis 2003). Populations of black bear, bobcat, and broad-winged hawk increased. Intense logging, wildfire activity and natural events such as heavy

rains, ice storms and early snow storms, significantly altered the northern forest landscape, changing both plant and animal species in abundance and diversity. Many of the barren mountaintops below 3,800 feet and other hardwood-dominated hillsides seen today are artifacts of early 20th century land use (Foss 1992, DeGraaf and Yamasaki 2001).

The young hardwood forests that emerged in the 1920s and 1930s after the old-field pine harvests provided premier habitat for ruffed grouse (DeGraaf and Yamasaki 2001). As these forests reached maturity late in the 1900s, there was a noticeable decline in the grouse population along with an increase in other species preferring more mature forest stands. Hence species dependent on early succession habitats declined to almost pre-settlement levels (Litvaitis 2003).

Eastern coyotes were first sighted in northern Maine in the 1930s, Vermont and New Hampshire in the 1940s, and Massachusetts in the 1950s. The turkey vulture, tufted titmouse, northern mockingbird, and Virginia opossum are newer arrivals. Wild turkey, re-introduced in the 1960s and 1970s, are flourishing well beyond their historic ranges.

Cultural Landscape Setting and Land Use History

Sunkhaze Meadows NWR and Carlton Pond WPA contain cultural resources that indicate use from prehistoric through historic time periods. These resources may contribute to further understanding of Maine's prehistory and history. This is especially true in the areas involving Native American settlement and subsistence, prehistoric and historic travel, and use of the peat bog. Archaeological investigations in areas surrounding Sunkhaze Meadows Unit indicate that activities relating to travel, hunting and fishing, fortifications, and group gatherings all likely occurred within today's boundaries of the Sunkhaze Meadows Unit (Robinson 2011).

Archaeological investigations near Carlton Pond WPA revealed areas of prehistoric settlement, resource procurement, and tool manufacture (Shaffer 2011). Furthermore, "at least 95 percent of the known prehistoric habitation and workshop sites in Maine are found next to waters that are (or were) navigable by canoe" (Shaffer 2011). The identification of archaeological sites adjacent to the waterways at both the refuge and WPA suggests that both Sunkhaze Meadows NWR and Carlton Pond WPA were heavily used waterways throughout prehistory.

Native Peoples

The first inhabitants along the Penobscot River and present-day Sunkhaze Meadows Unit were the Penobscot Indian Nation. Archaeological evidence shows native inhabitants on the Penobscot River fished for American shad as early as 8,000 years ago and for sturgeon as early as 3,000 years ago. Shad bones found in native settlements along the Sebec River in Milo (approximately 30 miles northwest of the refuge) are dated from 6,000 to 8,000 Before Current Era (BCE) (Penobscot River Restoration Trust, n.d.). Land adjacent to Sunkhaze Meadows Unit contains archaeological deposits of American eel, white perch, and bullhead dating to 8,500 BCE (Robinson 2011).

Archaeological excavations adjacent to the Sunkhaze Meadows Unit indicate prehistoric occupation in the area occurred from 8,500 years ago to at least 5,000 years ago (information

pertaining to the last 5,000 years of occupation was lost when the land was stripped for loam in the 1960s) (Robinson 2011). Additionally, records dating from 1671 indicate that this area contained the location of a Penobscot Indian Nation fort or stronghold (Robinson 2011). Fortifications were often constructed along access routes, in an area accessible from multiple locations (Robinson 2011). Research indicates that Sunkhaze Stream was an access route to the Union River and Blue Hill Bay, both important cultural areas throughout history (Cook 2007). The identification of a Penobscot Indian Nation stronghold so close to the Sunkhaze Meadows Unit indicates the area was heavily used prehistorically.

In addition to known resources around Sunkhaze Meadows Unit, at least 17 prehistoric archaeological sites have been documented near Carlton Pond WPA (Shaffer 2011). These sites relate to settlement and resource procurement and use, and 94 percent has been documented along the Sebasticook River, many near rapids or a confluence with another stream (Shaffer 2011).

Early European Settlement

European contact (e.g., explorers and traders) with native people began in the 16th century in much of New England. Foster and Motzkin (2003) suggest that European arrival prompted such rapid and profound changes to the lifestyle and land use practices of indigenous people that by the time colonists began to settle here, the landscape was already changing quickly.

European colonists brought new land use concepts such as permanent settlements and political boundaries. They shifted land use from primarily subsistence farming and gathering to harvesting and exporting natural resources (Foss 1992). By 1830, central New England was 80 percent cleared. In Maine, commercial logging for pine began as early as 1650, and all forest types have been cut since 1850 (Lorimer 1977). Archaeological sites from the European contact period have been documented near Carlton Pond WPA. Two sites have produced 17th century objects including kaolin pipes and a metal counters with fleurs-de-lis (Dunn 1968).

Despite initial heavy settlement, by the mid-19th century, many Euro-American settlers had left New England. The California gold rush, industrial revolution, new railroads, richer Midwestern soils, and the Civil War all contributed to movement to new lands. Abandoned farm fields began reverting back to forest. White pine seeded into the fields and pastures, and by 1900 was ready for harvest (Marchand 1987, DeGraaf and Yamasaki 2001). Between 1895 and 1925, 15 billion board feet of lumber was logged from central New England. An understory of hardwoods, released from the shade of white pine, emerged as the new dominant vegetation, a legacy that remains today (Marchand 1987, DeGraaf and Yamasaki 2001).

20th Century Influences

Farming activities dominated the landscape surrounding the town of Unity, including Carlton Pond WPA and the Benton and Sandy Stream units, well into the 1900s. Agriculture is still common today in this area.

Prior to becoming a national wildlife refuge in 1988, the Sunkhaze Meadows Unit was owned by Diamond Occidental Forest, Inc. The general land use in the area during this period was logging. During the 1970s energy crisis, the quality and depth of peat in the Sunkhaze Meadows Unit caught the eye of a peat mining company that wanted to mine the peat for use as a heating source. The sale of the Sunkhaze Meadows Unit to a mining company did not happen, and the land remained in limbo for several years until the Service was able to secure funding, with the help of The Nature Conservancy, to permanently conserve the area as a national wildlife refuge. Much of the surrounding lands remain in private ownership and have been heavily logged.

Socioeconomic Environment

Population

In 2010 the U.S. Census Bureau recorded Maine's population as 1,328,361, which was 0.43 percent of the total U.S. population at that time (308,745,538) (U.S. Census Bureau 2011). The population estimate for Maine is a 4.2 percent increase over the 2000 estimate (1,274,923) and a 3.8 percent increase over the 1990 estimate (1,227,928) (U.S. Census 2010).

The predominant racial group in Maine is identified as white (95.2 percent). Of the remaining 4.7 percent, 1.6 percent identify with two or more racial groups, 1.2 percent identify as black, 1 percent as Asian, 0.6 percent as American Indian or Alaskan native, and 0.3 percent as another race. For the entire state population, for any race, 1.3 percent identifies themselves as Hispanic or Latino.

Compared to the total U.S. population, Maine has a higher proportion of its population in the 45 to 64 years and 65 years and older age groups (see table 2.16).

Table 2.16. Gender and Age Group Breakdown for Maine and the U.S.

	Male:	**Female:**	**Under 18 years (percent)**	**18-44 years (percent)**	**45-64 years (percent)**	**65 years and older: (percent)**
Maine	650,056	678,305	274,533 (20.7)	432,072 (32.5)	410,676 (30.9)	211,080 (15.9)
U.S.	151,781,326	156,964,212	74,181,467 (24)	112,806,642 (36.5)	81,489,445 (26.4)	40,267,984 (13)

Also, Maine has a higher median age (42.7 years) compared to the rest of the U.S. The 2010 median age in Maine is older than the median age recorded for the State for 2000 (38.6 years). According to the 2010 U.S. Census, the U.S. median age is 37.2 years (Howden and Meyer 2011).

County Demographics

On a county level, Penobscot County (Sunkhaze Meadows Unit) is the most populous of the three counties that include refuge and WPA lands, with 153,923 people reported in 2010.

Kennebec County (Benton Unit) had 122,151 people, and Waldo County (Carlton WPA and Sandy Stream Unit) had 38,786 people. At 39.9 years, Penobscot County had the second youngest median age in the State (U.S. Census 2010; MSPO 2011).

Economic Data

Maine's population was projected as growing 0.5 percent from 2000 to 2010, slightly faster than in the 1990s (MSPO 2002). The area surrounding Sunkhaze Meadows NWR and Carlton Pond WPA is largely rural. Land in the vicinity of the Sunkhaze Meadows Unit is almost entirely forested, while areas near the Benton and Sandy Stream Units and Carlton Pond WPA are in agricultural or residential use. For decades the forest products industry was the major landowner and employer near the Sunkhaze Meadows Unit in Milford, although recent real estate sales indicate a shift to residential housing development. The lower Penobscot River Watershed ranks number one in the nation for projected housing density increases, more than 310,000 acres of its surface area are predicted to be developed in the next three decades (Stein et al. 2005).

The most current income data for Maine and its counties is for 2009. Table 2.17 provides the per capita and median household income for the U.S., Maine, and the three counties that include refuge and WPA lands as recorded for 2009. Both per capita and median household income in the U.S. are greater than in Maine or in the three counties.

In November 2011, the total civilian labor force in Maine was 691,538, of which 645,005 were employed and 46,533 were unemployed. The unemployment rate was 6.7 percent. The average weekly wage for Maine is equivalent to about $15.73 per hour or $32,708 per year, assuming a 40-hour week worked the year around (MDL 2011). By comparison, in 2009, the national average wage totaled around $45,500 per year (U.S. Census Bureau 2012).

Table 2.17. Per Capita and Median Household Income for the U.S., Maine, and Selected Counties (2009).

	Per Capita Income ($)	**Median Household Income ($)**
United States	27,041	50,221
Maine	24,980	45,708
Kennebec County	24,575	46,368
Penobscot County	22,813	42,366
Waldo County	21,790	41,697

Source: U.S. Census Bureau 2011

The total number of employees located in Maine in 2005 was 594,733. Statewide, the largest major industry sector was Health Care and Social Assistance, with 17 percent of the employment, followed by Retail Trade with 15 percent, and Manufacturing with 11 percent (MDL 2011).

Refuge and WPA Contribution to the Local Economy

According to Carver and Caudill (2007), in fiscal year 2006, recreational use on national wildlife refuges generated almost $1.7 billion in total economic activity nationwide. Other key data from that study are as follows:

- Nearly 35 million people visited national wildlife refuges in 2006, supporting almost 27,000 private sector jobs and producing about $543 million in employment income.
- Recreational spending on refuges generated nearly $185.3 million in tax revenue at the local, county, State, and Federal level.
- Approximately 82 percent of total expenditures at national wildlife refuges were from recreation other than hunting and fishing; fishing was 12 percent, and hunting was 6 percent.

The *2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation* (USFWS 2011) found that more than 90 million Americans, or 38 percent of the U. S. population age 16 years or older, pursued outdoor recreation in 2011. They spent $145 billion pursuing outdoor activities. More than 71 million people observed wildlife, while 33 million fished and 13.7 million hunted.

Specific data on recreation expenditures associated with Sunkhaze Meadows NWR or Carlton Pond WPA are not available. However, statewide data are available for Maine, in the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation report for Maine (*http://www.census.gov/prod/2008pubs/fhw06-me.pdf*). Total expenditures statewide for 2006 are listed below in table 2.18. Expenditures include trip-related expenditures, equipment purchases, licenses, contributions, land ownership and leasing, and other items (USFWS 2006).

Table 2.18. Total Expenditures in 2006, for Wildlife-Dependent Recreation Activities in Maine (U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau 2006)

	Residents and Nonresidents	**Residents**	**Nonresidents**
Hunting	$241,301,000	$201,439,000	$39,862,000
Fishing	$257,124,000	$132,312,000	$124,812,000
Wildlife Watching	$865,644,000	$724,461,000	$141,183,000

In addition to revenue sharing payments described under the subsection, Distributing Refuge Revenue Sharing Payments, under Refuge Administration, expenditures such as these have a direct benefit to local economies.

Refuge and WPA Administration

Staffing

Prior to the establishment of Sunkhaze Meadows NWR, Carlton Pond WPA was administered by Moosehorn NWR in Calais, Maine. Sunkhaze Meadows NWR was first staffed in 1990, and administration for Carlton Pond WPA was transferred to Sunkhaze Meadows NWR staff. The refuge's office was located in Old Town, Maine, not far from the Sunkhaze Meadows Unit in Milford. Fully staffed, the refuge and WPA employed four permanent staff, including a refuge manager, deputy refuge manager, outdoor recreation planner, and fire management officer, all stationed at Sunkhaze Meadows NWR. A seasonal fire crew was also stationed at the refuge. In

1999, the refuge lost three of the permanent positions, leaving just the refuge manager. That position was eliminated in 2008, and administrative responsibilities for Sunkhaze Meadows NWR and Carlton Pond WPA shifted to the Maine Coastal Islands NWR Complex located in Rockland, Maine.

Budget

Operations funding includes salaries, supplies, utilities, fuel, and all other operational activities (including wildlife inventories, habitat surveys, and management) that are not funded by special projects. Base maintenance funds, which are used to repair vehicles, equipment, and facilities, have been decreasing over the past 5 years. The replacement of vehicles, larger pieces of equipment (e.g., tractor, backhoe), or larger facilities (buildings) are funded as special projects.

Annual funding fluctuates according to the number and size of special projects funded that year (e.g., vehicle or equipment replacement, visitor service enhancements, and facility improvements). Funding has decreased substantially from the annual budget of nearly $300,000 in 2006. In 2010, the refuge operated on a budget of $5,800 for maintenance needs. While the refuge has applied for and received some grants, it did not receive any special project funding from the Refuge System from 2006 through 2011. In 2012, the refuge received about $67,800 to rehabilitate the Ash Landing trail and parking lot and some of the Johnson Brook trail. This work is scheduled to be conducted in 2013.

Table 2.19 provides the operations, maintenance, and total budget for Sunkhaze Meadows NWR and Carlton Pond WPA from 2006 to 2012. This includes funding for special projects from other Refuge System programs (e.g., Northeast Region Refuge System Roads Program).

Table 2.19. Allocated Budget for Sunkhaze Meadows NWR and Carlton Pond WPA, 2006 to 2012.

Fiscal Year	Operations	Maintenance	Total
2006	$ 130,691	$ 162,238	$ 292,929
2007	$ 127,222	$ 29,755	$ 156,977
2008	0	$ 5,800	$ 5,800
2009	0	$ 5,800	$ 5,800
2010	0	$ 5,800	$ 5,800
2011	0	$ 5,800	$ 5,800
2012	0	$ 73,600	$ 73,600

Land Acquisition

Table 2.20 summarizes the land acquisition history of the refuge. The Service currently owns 11,483 acres within its 11,666-acre approved acquisition boundary of the Sunkhaze Meadows

Unit. The Benton and Sandy Stream units are owned in their entirety, 334 acres and 58 acres, respectively. Carlton Pond WPA is also owned in the entirety of the acquisition boundary of 1,068 acres.

One resident of Milford has a right-of-way to access his leased cabin on Carter Meadow Road on the Sunkhaze Meadows Unit. The cabin is owned and maintained by the owner under a life-use agreement. Bangor Hydro-Electric Company has a 250-foot wide utility right-of-way through the western portion of the refuge to accommodate a 345 kV power transmission line.

Table 2.20. Land Acquisition History for Sunkhaze Meadows NWR and Carlton Pond WPA.

Unit Name	**Acres**	**Year**	**Funding Source***
Sunkhaze Meadows	11,483	1988 to 2007	LWCF
Benton	334	1992	FmHA
Sandy Stream	58	1992	FmHA
Carlton Pond WPA	1,068	1965 to 1968	MBCF
Conservation Easements (named by location)			
Towns of Corinth and Exeter	213.5	1996	FmHA
Town of Starks	36.8	1996	FmHA
Town of Fairfield	15.7	1993	FmHA
Town of Patten	54.2	1990	FmHA

**MBCF = Migratory Bird Conservation Fund: the funding source is receipts from the sale of Federal Migratory Bird Hunting and Conservation Stamps.*
LWCF = Land and Water Conservation Fund: funding sources include revenues from the sale of surplus Federal real property, motorboat fuel taxes, fees for recreation on Federal lands, and receipts from mineral leases on the outer continental shelf.
FmHA = Farmers Home Administration

Distributing Refuge Revenue Sharing Payments

Since 1935, the Service has made refuge revenue sharing payments to local municipalities containing lands under its administration. The actual amount of the payments is determined by formulas specified in the Revenue Sharing Act (16 U.S.C. 715) and annual funding appropriated by Congress. The formulas used to determine payments to local municipalities are based on the number of acres in each municipality and the appraised value of refuge lands in their jurisdiction. Currently for Sunkhaze Meadows NWR and Carlton Pond WPA, the Service makes revenue sharing payments to the towns of Milford, Benton, Troy, and Unity. Between fiscal years 2005 and 2009, combined payments to all municipalities have averaged about $7,500 per year. Between 2010 and 2011, combined payments to all municipalities have averaged about $4,400 per year (see table 2.21).

No entrance or user fees are charged for admission to any Service-owned lands that are part of Sunkhaze Meadows NWR or Carlton Pond WPA.

Table 2.21. Revenue Sharing Payments to Local Municipalities Between 2005 and 2011.

Fiscal Year	Amount Paid	Town Receiving Payment	Fiscal Year	Amount Paid	Town Receiving Payment
2005	$7,298.00	Milford	2009	$5,011.00	Milford
	$164.00	Unity		$107.00	Unity
	$873.00	Benton		$569.00	Benton
	$553.00	Troy		$361.00	Troy
2006	$6,755.00	Milford	2010	$3,531.00	Milford
	$152.00	Unity		$76.00	Unity
	$808.00	Benton		$401.00	Benton
	$512.00	Troy		$263.00	Troy
2007	$6,874.00	Milford	2011	$3,784.00	Milford
	$147.00	Unity		$81.00	Unity
	$781.00	Benton		$430.00	Benton
	$495.00	Troy		$273.00	Troy
2008	$5,333.00	Milford			
	$114.00	Unity			
	$606.00	Benton			
	$384.00	Troy			
2008	$5,333.00	Milford			
	$114.00	Unity			
	$606.00	Benton			
	$384.00	Troy			

Refuge and WPA Facilities

Cabins

When the refuge was established in 1988, there were five active cabin leases on the land. These cabins were owned by individuals while the land was leased under an agreement with the prior owner, Diamond Occidental Corporation. After the Service acquired the Sunkhaze Meadows Unit, the cabin owners were allowed to retain the cabins according to an annual special use permit and fee, but they were not allowed to sell the cabins or transfer ownership. While the Service owns the land, one cabin is still privately owned. The other owners have since given up their lease agreements and the Service acquired ownership of the cabins. One of these four cabins was demolished because the building was not needed and leaving the building posed a potential safety hazard because it was in disrepair.

The remaining cabins are important to achieving refuge purposes because they store materials and equipment for our habitat management and public use programs, and help support activities (including interpretive programs) of the refuge's Friends group.

Roads and Trails

Sunkhaze Meadows Unit has about 4 miles of gravel roads that provide management access. Because of past problems with illegal dumping, these roads are gated to control access. Many of the old logging roads created by previous owners have reverted to forest. Approximately 3 miles of trails are present primarily for management access and wildlife observation. The Sunkhaze Meadows Unit has six trails: Carter Meadow, Oak Point, Johnson Brook, Ash Landing, North Buzzy Brook, and South Buzzy Brook. There are no roads or dedicated trails on the Benton or Sandy Stream units or Carlton Pond WPA. See maps 2.6 through 2.9 for the location of public use infrastructure and trails. The Benton and Sandy Stream units have snowmobile trails that are maintained by snowmobile clubs through special use permits. Visitors are allowed to walk on these trails during the warmer months.

Other Infrastructure

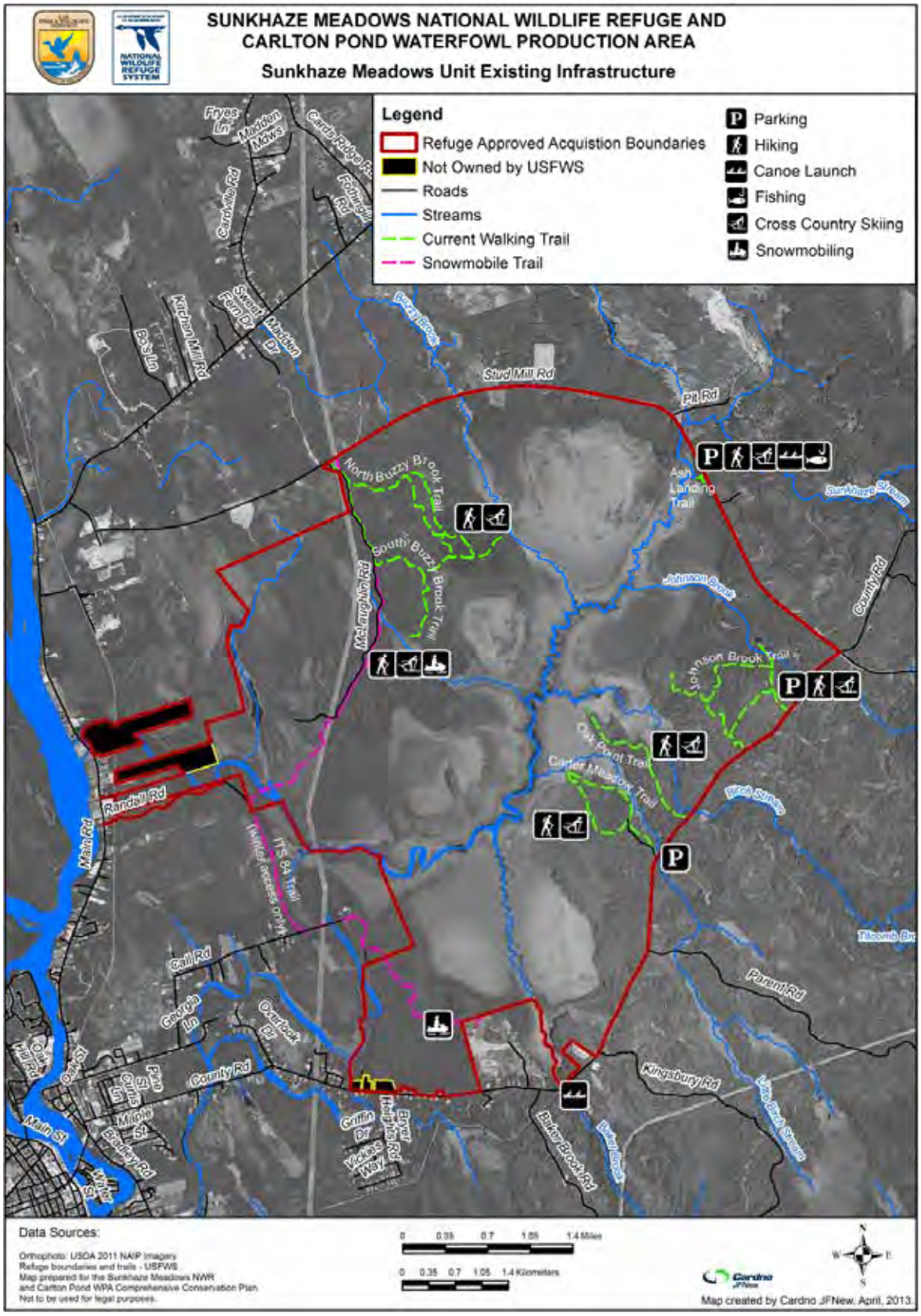
Other infrastructure at the Sunkhaze Meadows Unit includes information kiosks, boardwalks on some trails, three small parking areas, and several locked gates. The infrastructure currently located at Sunkhaze Meadows Unit is summarized in table 2.22.

Developed access to other refuge units and the WPA are more limited, although all are open to public access. Carlton Pond WPA has a water control structure and 150-foot long earthen dike built in 1965. Parking is available along adjacent roadside right-of-ways. There is a small dirt parking lot located on the Benton Unit. At Sandy Stream, visitors can park at an abutting gravel parking area owned by the town.

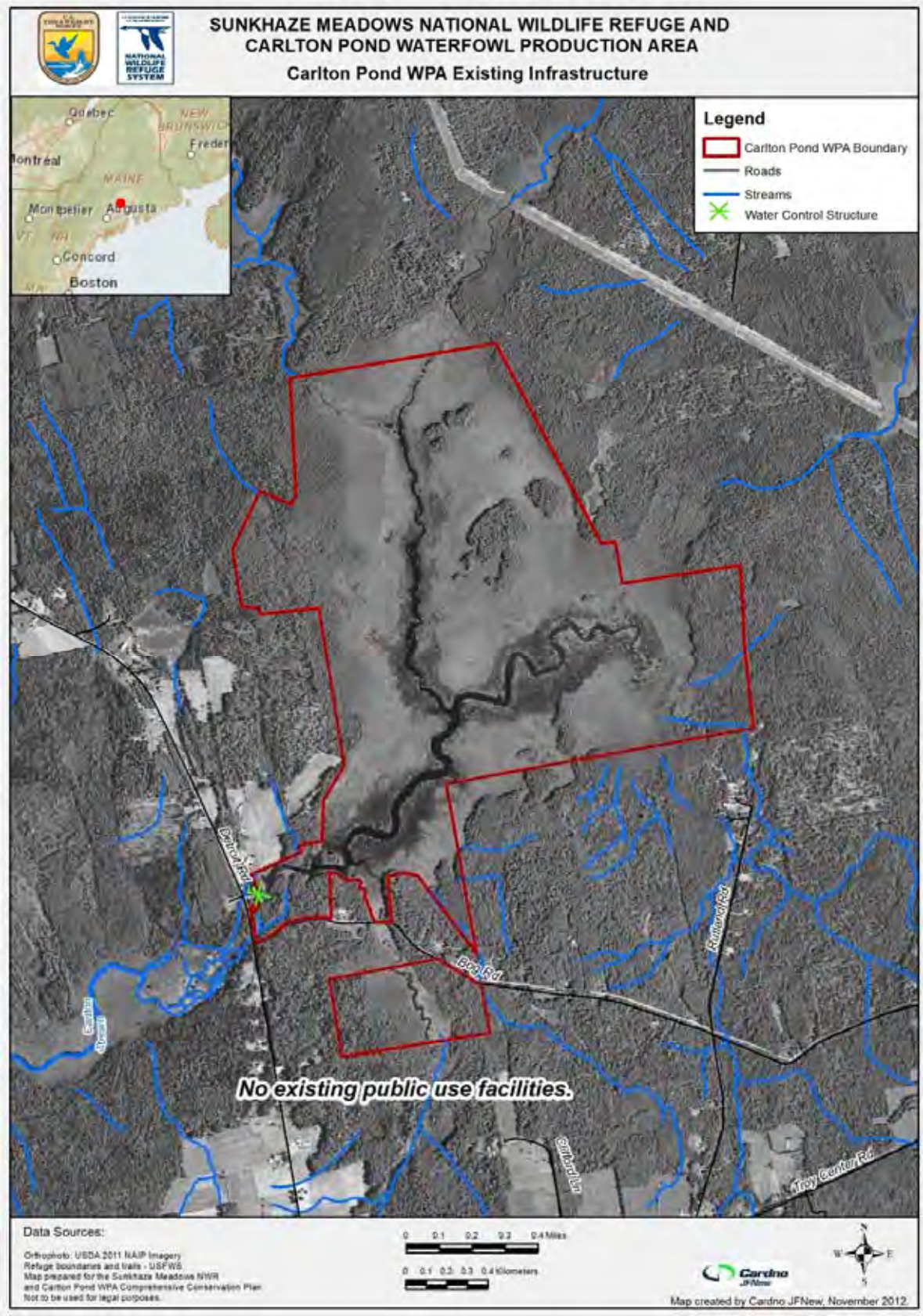
Table 2.22. Sunkhaze Meadows Unit Infrastructure

Infrastructure Type	Location	Date Constructed
Wildlife observation platform	Carter Meadow Trail overlooking the bog	2003
One panel information kiosk	Johnson Brook Trailhead	1999
Small gravel parking area	Along County Road, Johnson Brook Trailhead	1997
Three panel information kiosk	Ash Landing Trailhead	1997
Small gravel parking area	Along Stud Mill Road, Ash Landing Trailhead	1997
Gravel parking area (open only during hunting season)	Along McLaughlin Road, North Buzzy Brook Trailhead	1998
Small gravel parking area	Along County Road, for Carter Meadow/ Oak Point Trails	2004
Single panel information kiosk	Carter Meadow/ Oak Point Trails Parking lot	2011
Single panel information kiosk	Off-site at the town of Milford boat launch along the Penobscot River	2011

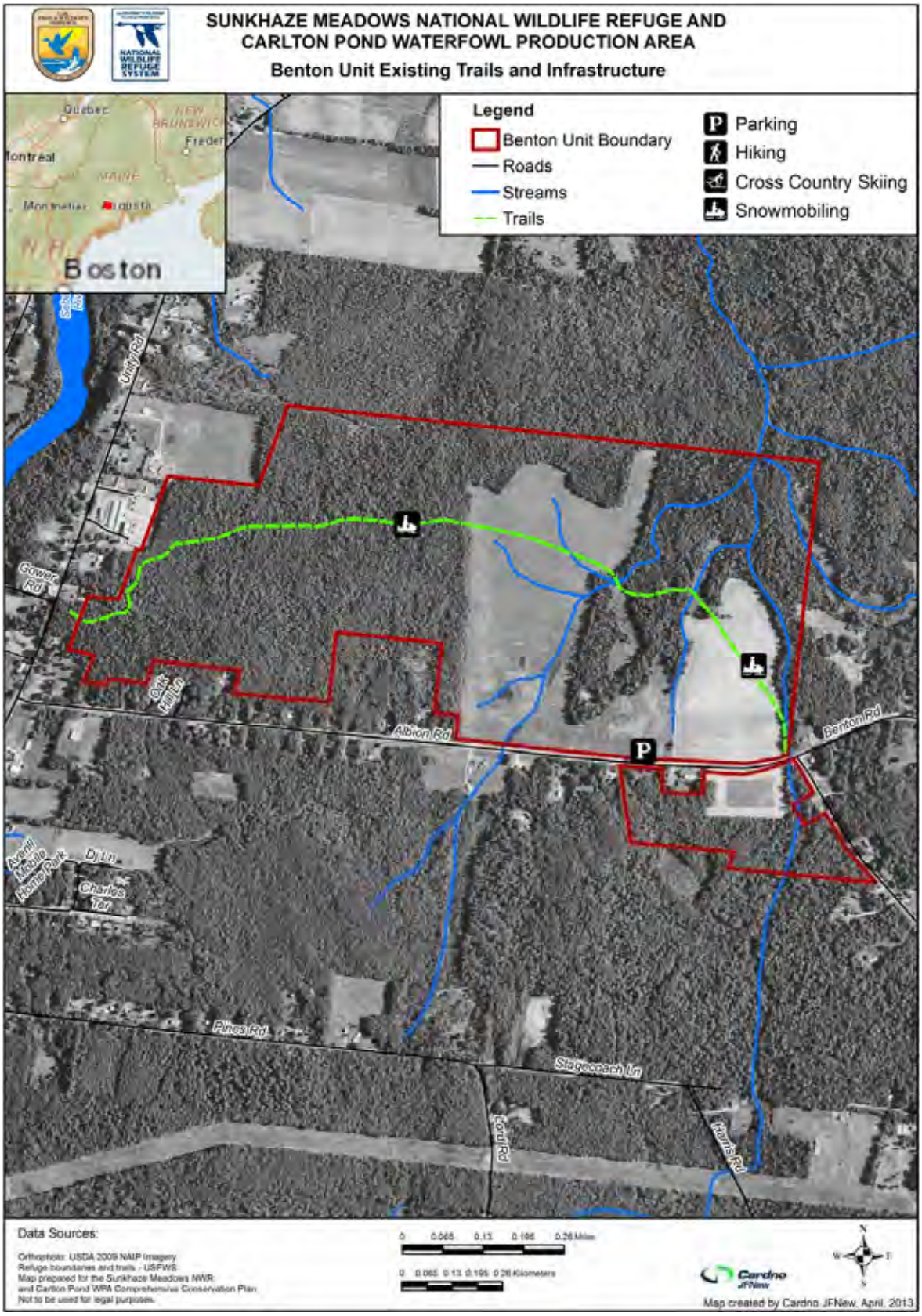
Map 2.6. Sunkhaze Meadows Unit Existing Infrastructure



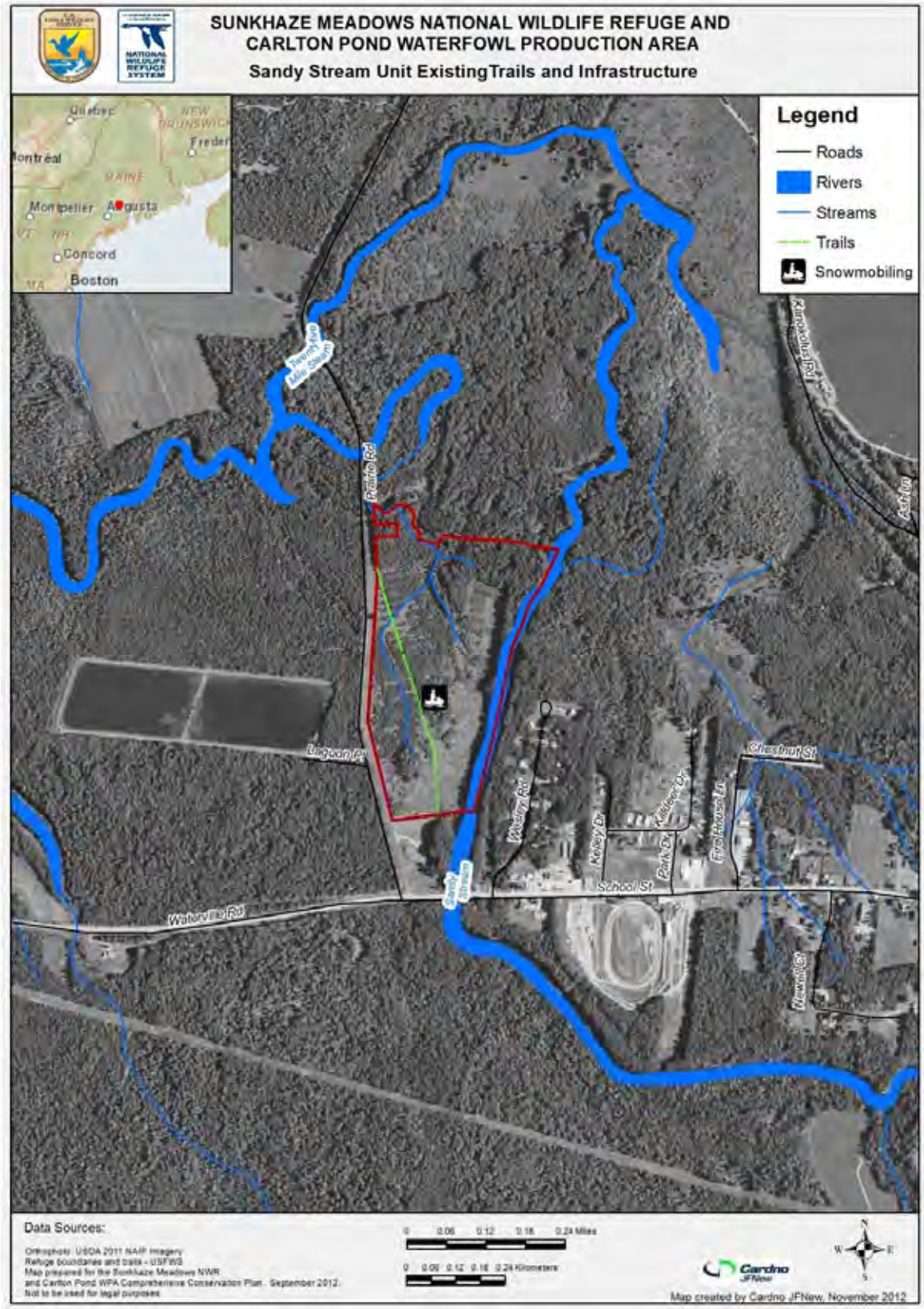
Map 2.7. Carlton Pond WPA Existing Infrastructure



Map 2.8. Benton Unit Existing Infrastructure



Map 2.9. Sandy Stream Unit Existing Infrastructure



Special Use Permits, Including Research

Special use permits are issued to individuals, organizations, and agencies that request the use of refuge facilities or resources beyond what is usually available to the public. To ensure that wildlife disturbance is minimized, special conditions and restrictions are analyzed individually for each request.

Currently, the refuge maintains several special use permits for various activities authorized on the various refuge properties:

- The Friends of Sunkhaze Meadows are authorized to access various portions of the refuge for biological management assistance, trail maintenance, and wildlife interpretation programming at the Sunkhaze Meadows Unit.
- The Sebasticook Land Trust has been allowed to provide public interpretive programs on refuge units.
- High school and college teachers are allowed to take classes to refuge units for various instructional activities.
- Researchers are allowed access for specific research projects.
- Trapping is considered a management activity. Individuals are authorized to trap certain wildlife at Sunkhaze Meadows Unit. All trapping on the refuge is subject to State licensing regulations as well as Service seasons and regulations.
- A farmer is permitted to annually mow 72 acres of the existing grasslands at the Benton Unit to maintain grassland habitat. Timing restrictions are included to protect grassland nesting birds during the summer nesting and fledgling period.
- Snowmobile clubs maintain existing snowmobile trails at Sunkhaze Meadows Unit (Maine's Interconnected Trail System [ITS] 84), Benton Unit, and Sandy Stream Unit.
- We currently authorize up to two field trial events for hunting dogs each year at Carlton Pond WPA if requested.

Refuge and WPA Public Use

A variety of public uses are authorized on refuge and WPA lands. By regulation (50 CFR 25.21), refuges are closed to public uses until they are opened by the Service. As discussed in chapter 1, Service and Refuge System Policies and Mandates Guiding Planning, to open a refuge to a public use, refuge staff must first determine if a use is appropriate. If the use is appropriate, we must then determine if it is compatible by analyzing potential effects of the use on the refuge's habitats and wildlife. Only activities that are determined to be both appropriate and compatible are allowed on refuges. In contrast, WPAs are open to fishing (50 CFR 32.4), trapping (50 CFR 31.16), and hunting of migratory game birds, big game, and upland game (50 CFR 32.1) per Federal and State regulations, unless we officially close a WPA to these uses.

To minimize confusion, we have made the authorized public uses on all of the refuge units and the WPA as consistent as practicable. This section describes public access and wildlife recreation opportunities for the refuge units and WPA. Additional information on recreation features on the refuge and at the WPA is available from the refuge Web site and in appendix B.

Public Access and Visitation

In 2011, over 90 million adults in the U.S. (16 years or older) participated in wildlife-related recreation. Of this total, 33.1 million people fished, 13.7 million hunted, and 71.8 million participated in at least one type of wildlife observation activity including observing, feeding, or photographing fish and other wildlife (USFWS and Census Bureau 2012). A similar level of participation is seen in Maine. According to Maine's Statewide Comprehensive Outdoor Recreation Plan (or SCORP), residents participate in outdoor recreation activities at a higher rate than the national average. Maine participation rates are especially high in nature-based activities (MBPL 2009). Sunkhaze Meadows NWR and Carlton Pond WPA are both located within a 2-hour drive from urban centers such as Bangor and Augusta and surrounding communities.

Sunkhaze Meadows NWR headquarters are located in Rockland, Maine, and are open Monday through Friday from 8:00 AM to 4:30 PM. The Sunkhaze, Benton, and Sandy Stream Units, and Carlton Pond WPA are open daily from sunrise to sunset. The Service does not charge entrance fees for the refuge or WPA. Pedestrian access is allowed both on and off trail at all refuge units and the WPA. The Service currently maintains the following access areas:

Sunkhaze Meadows Unit—As described under facilities, there are three parking areas open year-round, although these are not usually plowed by the Service in winter. There are six trails that total approximately 3 miles for visitors to access the Sunkhaze Meadows Unit. Visitors may also access this unit via small watercraft in Sunkhaze Stream. Canoe and kayak access is offered at Ash Landing for those willing to portage their watercraft in a few hundred yards. Visitors can access the southwest corner of the refuge via the State snowmobile trail (ITS 84).

Benton and Sandy Stream Units—There is one small parking area at the Benton Unit. Public parking for the Sandy Stream Unit is available adjacent to the refuge in a gravel parking area owned by the town. Visitors can also access both of these units via snowmobile trails.

Carlton Pond WPA—There are no public parking areas or trails at Carlton Pond WPA. Visitors usually access the WPA by boat. All launch sites are located off Service property, along roadside right-of-ways or on private lands.

In 2011, the Service completed an internal visitor services review (Toniolo 2011). This review summarized the current state of public use on the refuge and WPA, current programming, and condition of public use infrastructure. This review also provided recommendations for the planning team's consideration during development of this CCP. Much of the background information contained within this section is compiled from this review as well as current estimates provided by Service staff.

Our best estimates of visitation show approximately 6,300 visits were made to the refuge and WPA in 2012 (table 2.23). These visits generally consist of residents from the surrounding communities for each unit or the WPA, birdwatchers, hunters, anglers, snowmobilers, as well as college students and local, State, and Federal officials (Toniolo 2011). This contrasts statewide trends for Maine public lands, where residents of other states make up 53 percent of day visitors and over 90 percent of overnight visitors (MBPL 2009). Visitors participate in a variety of authorized public uses including bird watching in the spring; fishing, paddling, and hiking in the

summer; hunting primarily in the fall, and snowshoeing and skiing in the winter (see table 2.24). Based on refuge staff observations, overall visitation is highest in August and September, when most visitors are participating in wildlife observation or photography. A refuge visit is defined by the Service as, "the entry of one person onto a Refuge System station to engage in one recreational or educational activity. …One visitor could account for several visits." (USFWS 2005).

Table 2.23. Annual Visitation Estimates for Sunkhaze Meadows NWR and Carlton Pond WPA. Based on refuge staff estimations.

Annual Visitation Totals	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Sunkhaze Meadows NWR								
Total Visitation	4,606	4,700	4,800	4,870	4,700	4,950	5,100	5,200
Carlton Pond WPA								
Total Visitation	900	950	975	960	975	980	1,050	1,100
Total Combined Visitation	5,506	5,650	5,775	5,830	5,675	5,930	6,150	6,300

Table 2.24. Estimated Levels and Types of Use Occurring at Sunkhaze Meadows NWR and Carlton Pond WPA between 2005 and 2008. Based on refuge staff estimations.

Type of Visit	**2005**	**2006**	**2007**	**2008**
Sunkhaze Meadows NWR				
Total Visitation	4,606	4,700	4,800	4,870
Hunting	626	640	666	656
Fishing	676	680	700	690
Wildlife Observation and Photography	1,020	1,085	1,135	1,162
Environmental Education	475	153	153	44
Interpretive Program	35	20	50	197
Carlton Pond WPA				
Total Visitation	900	950	975	960
Hunting	132	135	145	145
Fishing	518	550	550	550
Wildlife Observation and Photography	210	220	245	240
Environmental Education	53	53	53	0
Interpretive Program	7	25	0	0

We anticipate visitation will continue to increase nominally as populations around the refuge and WPA continue to grow. According to data included in Maine's SCORP (MBPL 2009), the counties surrounding the refuge and WPA have experienced some growth between 2000 and 2008, and this growth is expected to continue. Kennebec County grew approximately 4 percent over this period. Penobscot County grew by approximately 3 percent, and Waldo County by 5 percent (MBPL 2009).

Priority Public Uses

The Refuge Improvement Act identifies six priority public uses that each refuge should evaluate for compatibility with its wildlife-first mandate:

1. Wildlife observation
2. Wildlife photography
3. Environmental education
4. Interpretation
5. Hunting
6. Fishing

All six priority public uses are authorized at Sunkhaze Meadows NWR and Carlton Pond WPA. Because of limitations in staff time and resources, the majority of the activities are self-directed, occurring when and where they are allowed by refuge regulations.

Wildlife Observation and Photography

Nationally, over 71 million people participate in some form of wildlife observation activity such as watching, feeding, or photographing wildlife (USFWS and Census Bureau 2012). Citing trends identified by the National Survey on Recreation and the Environment, Maine's SCORP highlights public recreation related to wildlife viewing and observation has experienced an 80 percent increase in participation between 2002 and 2009 across the Northeast (MBPL 2009). According to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, Maine's experiences over 800,000 participants in wildlife observation. These participants spent more than $865 million on activities and equipment related to wildlife watching (USFWS and Census Bureau 2008). Similar State-specific estimates of participation were unavailable for the 2011 survey at the time of this writing. However, according to surveys included in Maine's SCORP, a majority of State residents participate in natural scenery viewing or photography (73 percent) or wildlife observation and photography (62 percent) (MBPL 2009).

Visitors to the Sunkhaze Meadows Unit can access six wildlife observation trails and a portion of Maine's ITS snowmobile trail for opportunities to observe and photograph wildlife. Hikers may access the interior of the refuge on the Carter Meadow, Oak Point, Johnson Brook, Ash Landing, North Buzzy Brook, and South Buzzy Brook trails. An observation platform is located on the edge of the Sunkhaze Meadows peatlands at the end of the Carter Meadow Trail. Wildlife may also be observed by traversing McLaughlin Road. Visitors also canoe Sunkhaze Stream to view wildlife and experience the Sunkhaze Meadows Unit wetlands up close. Both Sunkhaze Meadows NWR and Carlton Pond WPA allow off trail use for public use access (on foot) for the purposes of wildlife observation, photography, berry picking, snowshoeing, cross country skiing, trapping, and hunting.

We currently use mechanized tools to maintain refuge trails, boardwalks, the observation platform, and other public use facilities in the wilderness study area. However, in recent years, some of the existing infrastructure at the Sunkhaze Meadows Unit has fallen into disrepair. Trails have become blocked by downed trees or overgrown by trailside vegetation. Boardwalks have buckled as a result of frost heave, making them difficult to use (Toniolo 2011). Maintaining trails to remove downed, overhanging, or hazard trees and vegetation relies on many hours of staff and volunteer time. Currently, the refuge cannot maintain all the trails present on the refuge. Based on feedback received during initial CCP scoping, we learned that most visitors use the trails on the south and eastern side of the refuge.

Because Carlton Pond WPA is dominated by open water and emergent wetlands, we have not developed a trail system here. However, many people enjoy paddling Carlton Pond to observe and photograph wildlife. At the Benton and Sandy Stream Units, no formal walking trails exist. Both units have snowmobile trails, allowed through special use permits. While not the primary use of these trails, they are used for occasional wildlife photography and observation during warmer months.

Environmental Education and Interpretation

The Friends of Sunkhaze Meadows NWR provides the majority of environmental education and interpretive programming, but this is limited to the Sunkhaze Meadows Unit. Refuge staff and the Friends of Sunkhaze Meadows NWR work with local teachers and students to help them use the Sunkhaze Meadow Unit for educational purposes. A National Science Foundation-sponsored education consortium conducts annual training seminars for teachers at the University of Maine. Teachers and students who participate in this program use refuge lands as an outdoor laboratory. Other interpretive programming and events sponsored by Friends of Sunkhaze Meadows NWR include presentations, guided walks and canoe tours. Refuge staff also participate in a small number of educational and interpretive events upon request.

In addition, interpretive kiosks and trail-side exhibits are located in the vicinity of the Johnson Brook Trail on the County Road and the Ash Landing Trail on the Stud Mill Road. There is an additional interpretive kiosk on a single panel located off-site at the town of Milford boat launch along the Penobscot River. These kiosks exhibit information related to the Sunkhaze Meadows Unit, including maps, wildlife profiles, and ecosystem highlights.

There are no kiosks, exhibits, or environmental education or interpretive programs at Carlton Pond WPA or at the Benton or Sandy Stream Units at this time.

Hunting

According to the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, over 13 million people nationally participate in hunting. Across New England, hunting has experience a slight increase in participation since consistent surveys were started in 1955 (USFWS and Census Bureau 2012). Specific to Maine, in 2006, there were over 146,000 hunters participating in an average of 14 days per hunter that year (USFWS and Census Bureau 2008).

Consistent with Statewide population trends, deer harvests have generally declined across the State and in the towns surrounding the refuge units and WPA (see table 2.25).

Table 2.25. Deer Harvest Data for the State and Towns Surrounding the Refuge and WPA (MDIFW 2013b).

Year	Maine	Unity	Milford	Benton	Troy
2011	18,839	102	18	60	70
2010	20,063	136	12	92	84
2009	18,092	111	13	82	105
2008	21,061	138	15	91	94
2007	28,884	170	14	121	122
2006	29,918	207	13	132	139
2005	28,148	213	17	142	137

Sunkhaze Meadows NWR and Carlton Pond WPA are open to all hunting seasons established by the MDIFW. This includes, but is not limited to, deer, coyote, bear, waterfowl, and upland game. Refuge hunt seasons coincide with State seasons except for coyote and bear seasons. Hunting has occurred at Sunkhaze Meadows NWR and at Carlton Pond WPA for decades, including prior to refuge and WPA establishment.

The refuge's hunt program follows Federal and State regulations for annual harvest levels and seasons by species. Coyote hunting on refuge lands is limited to October 1 through March 31 (50 CFR 32.38); this is more restrictive than the State season. Bear hunting season is limited to October 1 through the end of the State season (50 CFR 32.38). Non-toxic shot is required for all hunting seasons except deer and turkey (50 CFR 32.2 and 32.38), and, per Refuge System regulations (50 CFR 32.2) the use of bait is prohibited on the refuge and WPA. A refuge-issued permit is not required to hunt on the refuge or WPA. Hunters are responsible for knowing Federal and State laws and regulations that apply on Service-owned lands.

Fishing

In 2011, over 33 million people participated in fishing nationally. Across New England, fishing has experience a slight increase in participation since consistent surveys were started in 1955 (USFWS and Census Bureau 2012). According to the 2006 profile for Maine, over 350,000 anglers took to Maine's waters that year (USFWS and Census Bureau 2008).

Fishing is authorized at the Sunkhaze Meadows Unit and Carlton Pond WPA according to State fishing regulations. At the Sunkhaze Meadows Unit, waters are open to sport fishing under State of Maine fishing regulations. Lead-free sinkers are required for all fishing. Areas open for fishing on the refuge include: Baker Brook, Little Birch Stream, Birch Stream, Buzzy Brook, Johnson Brook, Little Buzzy Brook, Dudley Brook, and Sunkhaze Stream. Anglers can fish by boat in Sunkhaze Stream and its tributaries, or on the stream bank.

We have not established any trails or access areas to allow anglers to fish Carlton Pond. However, off-trail use is allowed for pedestrian access only (e.g., walking), and anglers are allowed to fish from the bank, or to ice fish. Anglers are also allowed to fish in Carlton Pond by boat. Fish species commonly sought by anglers include pickerel, yellow perch, bullheads, and black bass (Toniolo 2011).

The Benton Unit does not have access or habitat to support fishing. The Sandy Stream Unit does not have a formal trail system (except for the snowmobile trail) which is located away from the stream. While the Service does not have jurisdiction over Sandy Stream itself, visitors are allowed access to the stream for fishing from refuge lands.

Other Allowed Public Uses

Snowmobiling, cross country skiing, snowshoeing, berry picking, research, bicycling (Sunkhaze Meadows Unit only), and boating are currently allowed as other recreational use opportunities on Sunkhaze NWR and Carlton Pond WPA. Dog trials are another public use activity allowed only at Carlton Pond WPA. In the 1988 Environmental Assessment establishing the refuge (USFWS 1988), canoeing and snowmobiling are specifically mentioned as uses which we would allow on the refuge at appropriate times or in places where no conflict would occur with the objectives of the Refuge System. In addition, many of the nonpriority public uses that we allow are also important for connecting people with nature.

Snowmobiling is currently authorized from December 1 until April 15 when there is enough snow. Snowmobiling is a tradition for the local community who use snowmobiles on a portion of ITS 84 (Statewide Interconnecting Trail System) and a connector trail at the Sunkhaze Meadows Unit. It is also allowed on two other trails, one each on the Benton Unit and Sandy Stream Unit of the refuge. These trails existed prior to refuge establishment. The portion of the ITS-84 and the connector trail on the Sunkhaze Meadows Unit is approximately 4.6 miles long. Trails on the Benton Unit and Sandy Stream Unit are 1.0 mile and 0.5 miles respectively.

Local snowmobile clubs are responsible for maintaining the trails within the clubs' designated areas of operation, and they coordinate trail maintenance with refuge staff to ensure methods and timing does not adversely affect sensitive species. Trail maintenance activities are authorized through a special use permit, which also include stipulations to ensure minimal impacts to habitat and wildlife. Members of the local clubs are also responsible for placing trail junction, trail number, safety, and speed limit signs along the trails prior to December 1, and then maintaining them through the period of snowmobile use. The clubs then are required to collect the signs and pick up any litter prior to the reopening of refuge roads after the mud season closure (typically before Memorial Day weekend). New trail construction or off trail use is not permitted.

The 4.6 mile long trail at Sunkhaze Meadows Unit runs for a short distance down the powerline right-of-way until it intersects with the McLaughlin Road then follows the road until it ends and crosses Sunkhaze Stream (see map 2.6). By allowing the snowmobile traffic on the road for the majority of that distance it minimizes effect to both vegetation and wetlands. The traditional trail route will be maintained into the future but we reserve the right to adjust the route between the trail and McLaughlin Road to address future safety concerns as the need arises. Trails at the Benton and Sandy Stream Units (one mile and one-half mile respectively) are maintained in the same location each year (See map 2.8 and 2.9).

Bicycling at Sunkhaze Meadows NWR is limited to the dirt-surfaced McLaughlin Road at the Sunkhaze Meadows Unit, where this use has been allowed in the past. Bicycling on the hiking trails or off trail is not allowed.

Walking and hiking on the refuge and WPA are permitted throughout the year from sunrise to sunset daily. There are no restrictions during hunting season, but visitors are encouraged to wear blaze orange vests. Cross country skiing and snowshoeing, were originally authorized in 1994 on refuge trails when enough snow is present. Cross country skiing and snowshoeing is permitted December through March (Toniolo 2011).

Berry picking is permitted on Sunkhaze Meadows NWR. Visitors can pick raspberries and blackberries in the summer and blueberries and cranberries in the fall. Harvesting is allowed during daylight hours.

Boating is allowed on Sunkhaze Stream and in Carlton Pond. Some visitors believe it's one of the best ways of experiencing these areas. Based on comments from visitors, spring is typically when most motorized boating occurs on the refuge. In spring, Sunkhaze Stream and its tributaries flood sections of peat bog and forested wetland which creates a large lake. During flooding, the stream channel is not visible and navigation can be disorienting. Because there is no easy trailer access to Carlton Pond, boating is largely limited to small boats that can be hand-carried to the water. Boating is also more common at Carlton Pond when water levels are higher.

Retriever trials at Carlton Pond WPA are also occasionally allowed (not more than a few days each year) under a special use permit. This is not a priority public use itself; however, the use of dogs to retrieve downed game is related to the priority public use of hunting.

Archaeological and Historical Resources

Sunkhaze Meadows NWR and Carlton Pond WPA contain cultural resources that indicate use from prehistoric through historic time periods (see Wildlife Trends and Changes in section 2.3). Archaeological investigations in areas surrounding Sunkhaze Meadows indicate that activities relating to travel, hunting and fishing, fortifications, and group gatherings all likely occurred within the Sunkhaze Meadows Unit (Robinson 2011). There is one documented archaeological resource on the Sunkhaze Meadows Unit. It is the oldest known Native American 'formal' (i.e., a special location used repeatedly) cemetery in Maine (Robinson 2011). While the cemetery was likely completely destroyed in 1922 during road construction, records created by the construction foreman provide detailed information on the cemetery, which dates to at least 7,000 years B.C.E. (Robinson 2011).

Given the known prehistoric activities in the area surrounding the Sunkhaze Meadows Unit and the environmental setting, several additional types of cultural resources may be located within the refuge itself. The Sunkhaze Stream likely was a major access route to the upper tributaries of the Union River (Robinson 2011). As such, campsites near portages may be common along the main channel of Sunkhaze Stream. The wetland-peatland complex and other areas along Sunkhaze Stream may also contain additional archaeological resources dating between 3000 to 11,000 years ago associated with receding lake and pond shorelines (Spiess, personal communication April 7, 2011). In addition, the wide range of resources located within Sunkhaze Meadows Unit suggests hunting, trapping and fishing all occurred within the refuge from prehistoric through historic times. Given this setting, fishing and trapping gear may be preserved within the permanently saturated conditions of the wetland.

Archaeological investigations near Carlton Pond WPA have located areas of prehistoric settlement and resource procurement and tool manufacture (Shaffer 2011). Documented resources near the Carlton Pond WPA include 17 prehistoric sites dating to the Archaic (from 8,500 to 800 B.C.E.), Ceramic (from 800 B.C.E. to Anno Domini (A.D.) 1500), and Contact (A.D. 1500 to 1675) periods, and three historic sites which contain contact-period artifacts as well as early 19th century artifacts. Given that "at least 95 percent of the known prehistoric habitation and workshop sites in Maine are found next to waters that are (or were) navigable by canoe" (Shaffer 2011), there is a high likelihood that additional unidentified archaeological resources are located within Carlton Pond WPA. Historic sites identified near Carlton Pond WPA include a petroglyph, likely representing a surveyor's mark from the mid-19th century, two contact-period sites containing lithic artifacts as well as kaolin pipes and a metal counters dating to the 17th century, and a late 19th to early 20th century site containing artifacts, the base of a bridge or dam, and a dam-related structure (Shaffer 2011).

Chapter 3

USFWS

Riparian floodplain forest at the Sandy Stream Unit.

Alternatives

- **Introduction**
- **Formulating Alternatives**
- **Actions Considered but Eliminated from Further Study**
- **Actions Common to All Alternatives**
- **Actions Common to Alternatives B and C**
- **Alternative A. Current Management(Continuing Current Management)**
- **Alternative B. Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)**
- **Alternative C. Increased Shrub and Young Forest Habitat and Increased Public Use**
- **Comparison of Alternatives**

Introduction

This chapter describes our process for formulating alternatives, the actions that are common to all of the alternatives, the actions or alternatives we considered (but did not fully develop), and the three alternatives we analyzed in detail. We have identified alternative B as our preferred alternative; however, this alternative may be modified in response to public comments received on this draft document. The final preferred alternative may end up incorporating parts of the other alternatives described here, or other minor modifications based on public comments. At the end of this chapter, table 3.1 compares how each of the alternatives addresses key issues, supports major programs, and achieves refuge goals.

Formulating Alternatives

Relating Goals, Objectives, and Strategies

The refuge goals are intentionally broad, descriptive statements of the desired future condition of refuge resources. Goals articulate the principal elements of the refuge purposes and our vision statement, and provide a foundation for developing specific management objectives and strategies. All of the alternatives analyzed address the same goals.

The objectives are essentially incremental steps toward achieving a goal; they further define management targets in measurable terms. Typically, they vary among the alternatives and provide the basis for determining more detailed strategies, monitoring refuge accomplishments, and evaluating successes. “Writing Refuge Management Goals and Objectives: A Handbook” (USFWS 2004a) recommends writing “SMART” objectives that possess 5 characteristics: (1) specific; (2) measurable; (3) achievable; (4) results-oriented and (5) time-fixed. A rationale accompanies each objective to explain its context and importance. The objectives outlined in the alternative selected for the final CCP will guide the future development of refuge step-down plans, which we describe later in this chapter.

Strategies are the specific or combined actions, tools, or techniques we may use to achieve the objectives. The list of strategies under each objective represents the potential suite of actions we may implement. We will evaluate most of them further as to how, when, and where we should implement them when we write our refuge step-down plans. We will measure our successes by how well our strategies achieve our objectives and goals.

Developing Alternatives, Including the “No Action” Alternative

Over the course of several months, the core planning team and refuge staff held meetings and conference calls to identify a wide range of possible management objectives and strategies that could achieve our goals. After these were initially developed, we began the process of designing detailed management alternatives. Each management alternative is intended as an alignment of complementary objectives and strategies designed to meet refuge purposes, vision, and goals, and the Refuge System mission and goals, while responding to the issues and opportunities that arose during the planning process.

We grouped objectives that seemed to fit together in what we loosely term “alternative themes.” For example, we considered such themes as “increased habitat enhancement and improved visitor services” and “intensive habitat management and increased visitation.” After forming objectives into three management alternatives, we further evaluated how the objectives would interact and how well they would fulfill the refuge purposes.

In this chapter, we fully analyze three alternatives that characterize different ways of managing the refuge over the next 15 years. As required by NEPA, we believe they represent a reasonable range of alternatives for achieving the refuge purposes, vision, and goals, and addressing the issues described in chapter 1. Unless otherwise noted, refuge staff would implement all actions, to the extent possible given current and future budget and staffing levels (see section 3.3.12 below).

Alternative A addresses the NEPA requirement of a “no action” alternative, which we define as continuing current management. It describes our existing management priorities and activities, and serves as a baseline for comparing and contrasting alternatives B and C. To better understand the scope and context embodied within the various alternatives, please see chapter 2, “Affected Environment,” for detailed descriptions of current refuge resources and programs.

Many of the objectives in alternative A do not strictly follow the guidance in the Service goals and objectives handbook because we are describing current management decisions and activities that we established prior to that guidance. Our descriptions of those activities derive from a variety of formal and informal management decisions and planning documents. Thus, the objectives in alternative A are fewer and more subjective than are those in alternatives B or C.

Alternative B, the Service-preferred alternative, combines the actions we believe would best achieve the refuge purposes, vision, and goals, and respond to issues. It emphasizes the preservation of specific refuge habitats to support focal species whose habitat needs benefit other species of conservation concern in central Maine. In particular, we emphasize preservation and protection of the peat bog complex and surrounding late-successional forest lands within the Sunkhaze Meadow Unit. At the same time, we are maintaining and possibly expanding early-to-mid successional habitat management at Benton and Sandy Stream Units. Management of Carlton Pond WPA would largely remain unchanged under alternative B. Under alternative B, we would also work closely with partners to increase and enhance the public use experience at all refuge units.

Alternative C proposes a more active management approach to both habitats and public use. Habitat management under this alternative has an increased focus on early successional habitat creation and maintenance. Public use would see increases across all units similar to those proposed under alternative B.

Actions Considered but Eliminated from Further Study

During the alternatives development process, the following actions were discussed, but were eliminated from further consideration.

Designating Wilderness Areas

The Refuge System planning policy requires that we conduct a wilderness review during the CCP process. Our initial inventory of this refuge determined that a portion of the Sunkhaze Meadows Unit meets the eligibility criteria for a wilderness study area (WSA) as defined by the Wilderness Act. Therefore, we analyzed the refuge's suitability for wilderness designation, solicited public comments, and reviewed alternatives for recommending wilderness designation. After completing the wilderness review, we have determined that a wilderness recommendation is not warranted at this time. See appendix E for the results of the wilderness inventory.

Establishing a Research Natural Area

Along with reviewing the suitability for wilderness designation, we considered establishing portions of forest and wetland habitat in the Sunkhaze Meadows Unit as a research natural area. The Service has administrative authority to designate research natural areas. Unlike wilderness designation, recreation is not a primary use in these areas. Instead, research natural areas are intended to maximize the educational and scientific values of a natural area by ensuring minimal management and disturbance. This may include closing these areas to public use and to active habitat management. Because of existing public use, a lack of expressed interest from the research community, and because we do not anticipate a need to exclude active habitat management, we have eliminated this from further study under any of the alternatives.

Expanding the Refuge and WPA Coyote Hunting Season

Concerns were raised during scoping regarding coyote populations and their potential threat to the local deer population. One individual expressed interest in the refuge expanding opportunities for coyote hunting to coincide with the State seasons. Deer populations in Maine have been declining for many years (MDIFW 2011). White-tailed deer are near their northern range limit in Maine and are not well adapted for harsh winter conditions (Jakubus 1999). Consequently, winter severity is considered to be the greatest contributor to deer mortality in Maine (MDIFW 2011). Predation on deer, primarily by bear and coyote, also is considered a contributing factor especially in winter (MDIFW 2001, DPWG 2009). MDIFW has encouraged coyote hunting in targeted portions of the State where deer populations are considered most reduced. These targeted areas include portions of western, northern, and eastern Maine where deer populations are considered to be low (around 5 deer per square mile) (DPWG 2009). There are fewer quality deer wintering areas in the northern, eastern, and western parts of Maine, which are thought to contribute to a lower deer population in these areas (MDIFW 2001). Southcentral portions of Maine, which contain Sunkhaze Meadows NWR and Carlton Pond WPA, are not within the State's priority target areas for deer management (MDIFW 2011).

Studies have shown that coyote and deer densities have influenced each other, but the effects of coyote predation on deer differ among geographic regions (Beason 1974). Some studies indicate that coyote predation may affect deer populations in the northeastern portion of the U.S. (e.g.,

Whitlaw et al. 1998, Ballard et al. 1999). Coyotes are also known be scavengers, often consuming deer that were killed by cars or other predators (Berg and Kuehn 1986, Turner 2011). Regardless, predator control efforts are usually ineffective, particularly long-term. Some studies of coyote populations in the western U.S. estimate that coyote populations can experience mortality rates of more than 70 percent before year to year population levels decline (Perry and Hilton 1980, Parker 1995 as cited in Jakubus 1999). Another study in Colorado found it took about 8 months for a coyote population to reach pre-removal pack size and density levels after 2 years of intensive coyote removal efforts (coyote populations were reduced between 44 and 75 percent each year) (Gese 2005). In addition, after reviewing 38 articles on predation and deer populations (mule, back-tailed, and white-tailed deer) in North America, Ballard et al. (2001) concluded that trapping and ground shooting, by themselves, were ineffective at reducing predator densities.

Maine State regulations allow daytime hunting for coyote year-round and night-time hunting from December 16 through August 31. State regulations also allow the use of up to six dogs to hunt coyotes during daytime, but do not allow the use of dogs during night hunting season. Currently, the refuge is open to day and night hunting for coyote between October 1 and March 31. The refuge's shortened season is intended to reduce disturbance migratory birds during migration (spring and fall) and nesting (spring and summer).

Many raptor species begin nest building and breeding in March and April and continue into May, such as osprey (Poole 1984, Wetmore and Gillespie 1976), red shouldered hawk (Portnoy and Dodge 1979), and northern goshawk (Speiser and Bosakowski 1991). According to refuge staff, neotropical migrants such as warblers, swallows, and hummingbirds generally arrive following raptor migrations, typically around May at Sunkhaze Meadows Unit. There are several studies documenting disturbance effects of hunting on wildlife (see Cline et al. 2007 for a summary). There are also many studies that document human and canine disturbance of wildlife (e.g., Miller et al. 2001, Banks and Bryant 2007, Lenth and Knight 2008). Brief absence by parent birds can lead to missed feedings, predation on eggs or young, or exposure to overheating, chilling, or dehydration of eggs or young (Call 1979, Suter and Joness 1981). Ground nesting birds are also affected by disturbance during the nesting season. In the Appalachian Mountains, exposure was a leading cause (44 percent) of ruffed grouse chick mortality—equal to the combined predation by both birds and mammals (Smith et al. 2004).

In addition to potential disturbance, a stable coyote population may benefit Federal trust species like migratory birds, by removing or competing with other predators. Few studies have been conducted on the indirect effects of coyotes on non-prey animals in the Northeastern U.S.; however, one study in another region has shown that coyotes can increase the nest successes of ducks and ground-nesting sparrows by reducing populations of other predators such as red foxes and raccoons which often prey on bird eggs and young (Gompper 2002).

Sunkhaze Meadows NWR and Carlton Pond WPA are managed to fulfill their designated purposes along with the Refuge System's mission (see chapter 1). Because of this and the potential disturbance to Federal trust resources noted previously, we have decided not to further evaluate expanding the refuge's coyote hunting season to coincide with the State's season under one of the alternatives.

Reducing or Eliminating Existing Compatible Public Uses

As part of the CCP process, we evaluated all of the approved public uses of the refuge and WPA currently in place, for their appropriateness (when applicable) and compatibility. There are many laws, policies, establishment documents, and other mandates that we use to guide public use programs on the refuge and WPA. In addition, we also considered the purpose of this document which is to develop a CCP that best achieves the refuge and WPA purposes; attains the vision and goals developed for the refuge and WPA; contributes to the Refuge System mission; addresses key issues and relevant mandates; and is consistent with sound principles of fish and wildlife management.

The Refuge Improvement Act identifies six priority public uses that are to receive enhanced consideration in refuge planning: fishing, hunting, wildlife observation, photography, environmental education, and interpretation. Service policy and the Refuge Improvement Act mandate that we provide high-quality opportunities for those priority public uses when they are compatible with refuge purposes, goals, and other management priorities. The Refuge Improvement Act does not establish a hierarchy among the six priority uses, but requires us to facilitate them when they are compatible and appropriate. Certain priority public uses also have specific Executive Orders and regulations that we must consider. For example, Executive Order No. 13443 (August 16, 2007) directs the Department of the Interior and other Federal land management agencies to “facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.” It also states that Federal agencies are to “manage wildlife and wildlife habitats on public lands in a manner that expands and enhances hunting opportunities, including through the use of hunting in wildlife management planning.” The CFR specifies that WPAs are to be open to fishing (50 CFR 32.4) and hunting (50 CFR 32.1) unless “temporarily suspended…upon occasions of unusual or critical conditions…” (50 CFR 32.1 and 32.4).

In addition to the six priority public uses, the refuge and WPA are open to the following public uses: boating; skiing and snowshoeing; snowmobiling on designated trails (Sunkhaze Meadows NWR Units only); gathering of blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds for personal use; dog walking on trails (Sunkhaze Meadow Unit only); limited dog trials (Carlton Pond WPA only); and scientific research. These are historic uses of the refuge and WPA and they have been occurring for years. In addition, we committed to allowing several of these uses at the Sunkhaze Meadows Unit of the refuge, if deemed compatible, in the refuge’s establishing documentation (USFWS 1988). To date, refuge staff have observed minimal adverse impacts to refuge resources associated with these activities, and there have only been minor conflicts between user groups. Several of these uses also facilitate visitor participation in priority public uses (e.g., boating, skiing, snowshoeing).

After considering all of these factors, we have determined that reducing or eliminating existing, compatible public uses would not meet the purpose of this document because: 1) it would not satisfy goals 4, 5, and 6 of the draft CCP and EA, 2) it would not support the establishing documentation for Sunkhaze Meadows NWR, 3) it would not support Service mandates described above, and 4) it would not support the provision of the Refuge Improvement Act that identifies six priority public uses that should receive enhanced consideration in refuge planning if they are compatible.

Actions Common to All Alternatives

All of the alternatives share some common actions. Some are required by law or policy, or represent actions that have undergone previous NEPA analysis, public review, agency review, and approval. Others may be administrative actions that do not require public review, but that we want to highlight in this public document.

All of the following actions are current practices or policies that would continue under all alternatives:

- Continuing land protection by purchasing fee title and conservation easements from willing sellers, and accepting donations, within the current acquisition boundary.
- Monitoring and controlling invasive species.
- Furbearer management.
- Monitoring and abatement of diseases affecting wildlife and forest health.
- Facilitating or conducting biological research and investigations.
- Protecting cultural resources.
- Providing wildlife-dependent recreational opportunities.
- Completing findings of appropriate use and compatibility determinations.
- Administering the refuge, current FmHA conservation easements, and the WPA.
- Completing the wild and scenic river eligibility study.

Protecting Land

The Service will continue to work with willing sellers and in partnership with other agencies and organizations, to protect the remaining 92 acres within the refuge's current authorized acquisition boundary.

Although we intend to acquire suitable and available habitat within the approved refuge boundary from willing sellers, acquiring those lands is not a primary focus of refuge management since the Service already owns the majority of lands within the approved boundary. Instead, we would focus on creating partnerships with adjacent and nearby landowners in support of broader conservation issues that affect the refuge (e.g. providing additional public access, reducing habitat fragmentation).

We will continue to protect Service interests in the FmHA conservation easements and Carlton Pond WPA.

Monitoring and Controlling Invasive Species

The establishment and spread of invasive species, particularly invasive plants, is a significant problem that reaches across all habitat types. For the purposes of this discussion, we use the definition of invasive species contained in the Service Manual (620 FW 1.4E): "Invasive species are alien species whose introduction does or is likely to cause economic or environmental harm, or harm to human health. Alien species, or non-indigenous species, are species that are not native to a particular ecosystem. We are prohibited by Executive Order, law, and policy from

authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere."

In this section we discuss only nonnative species. In some instances, native species whose overabundance in a particular area interferes with our management objectives are undesirable from a management standpoint and we address their management in a later section of this chapter.

The unchecked spread of invasive plants threatens the biological diversity, integrity, and environmental health of all refuge habitats. In many cases, they have a competitive advantage over native plants and form dominant cover types, reducing the availability of native plants as food and cover for wildlife. Over the past several decades, government agencies, conservation organizations, and the public have become more acutely aware of the negative effects of invasive species. Many plans, strategies, and initiatives target more effective management of invasive species, including The National Strategy for Management of Invasive Species for the National Wildlife Refuge System" (USFWS 2003), Silent Invasion—A Call to Action, by the National Wildlife Refuge Association (NWRA 2002), and Plant Invaders of Mid-Atlantic Natural Areas, by the Service and the National Park Service (Swearingen et al 2010). The Refuge System biological discussion database and relevant workshops continually provide new information and updates on recent advances in control techniques. Sources of funding are also available, both in the Service budget and through competitive grants, to conduct inventory and control programs.

Sunkhaze Meadows NWR and Carlton Pond WPA contain few species targeted for invasive species management, but threats from invasive species are likely to increase over time. Our staff and volunteers continue to be vigilant for other invasive plants and animals should they be identified at Sunkhaze Meadows NWR and Carlton Pond WPA.

Guidance on managing invasive species on refuges appears in the Service Manual (620 FW 1.7G). The following actions define our general strategies on the refuge:

1. Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and to prevent new and expanded infestations of invasive species.
2. Conduct refuge habitat management to prevent, control, or eradicate invasive species using techniques described through an integrated pest management plan, or other similar management plan. The plans comprehensively evaluate all potential integrated management options, including defining threshold/risk levels that would initiate the implementation of proposed management actions.
3. Evaluate native habitat management activities with respect to their potential to accidentally introduce or increase the spread of invasive species and modify our habitat management operations to prevent increasing invasive species populations.
4. Refuge integrated pest management (IPM) planning addresses the abilities and limitations of potential techniques including chemical, biological, mechanical, and cultural techniques. See additional discussion on IPM (section 3.3.3 below).
5. Manage invasive species on refuges under the guidance of the National Strategy for Invasive Species Management (USFWS 2003b) and within the context of applicable policy.

The following actions define our specific strategies for the refuge:

1. Continue the treatment of the most problematic species ranked in management priority based on (a) the extent to which the species is established on the refuge, (b) the potential ecological impact of the species on refuge plant communities, and (c) the degree of management difficulty involved in controlling the species.
2. Maintain early detection and rapid-response readiness regarding new invasions.
3. Maintain accessibility to affected areas for control and monitoring.
4. Continue to promote research into biological control alternatives.
5. Continue and increase efforts to involve the community in promoting awareness of invasive species issues, and seek assistance for control programs on and off the refuge.

While not currently on the refuge or WPA, two nonnative insect pests found elsewhere do pose a long-term concern for refuge and WPA habitats: emerald ash borer (*Agrilus planipennis*) and the Asian longhorn beetle (*Anoplophora glabripennis*). Emerald ash borer (EAB) is a nonnative insect originally from Asia. It was first identified in Michigan in 2002. Since then, it has spread to 14 states and 2 Canadian provinces (MSU 2012). EAB reduces the health of and often kills the trees it infects. EAB feeds exclusively on ash trees, although it does feed on all varieties of ash, including black, green, and white (MDNR 2012). While this pest has not been found in Maine to date, it has been confirmed as close as Pennsylvania and New York. Its rapid spread and devastating effects on ash populations is a concern for the long-term habitats of Sunkhaze Meadows NWR and Carlton Pond WPA: both of which contain populations of various ash species. Asian longhorn beetle (ALB) is a destructive wood-boring beetle that impacts maples and other hardwoods such as birch, elm, and willow. Adults and larvae chew and bore into their host tree, which weakens and often kills the tree. ALB was first discovered in the U.S. on several hardwood trees in Brooklyn, New York, in 1996. It is currently found within New York, New Jersey, and Massachusetts. It was previously found in Chicago, Illinois, but was successfully eradicated in 2008 (USDA 2012). We will continue to monitor the spread of these pests nationally and continue to evaluate the potential for their presence at both the refuge and WPA.

Managing Pest Species

At times, native plants and animals interfere with management objectives. The Refuge Manual (7 RM 14.4A) defines a pest as “Any terrestrial or aquatic plant or animal which interferes, or threatens to interfere, at an unacceptable level, with the attainment of refuge objectives or which poses a threat to human health.” That definition could include the invasive species defined above, but in this section, we are limiting our discussion to native species that may interfere with management. Currently, we are unaware of any native plant or animal species on the refuge that meet this definition of a pest species. If we identify pest species on the refuge in the future, we will use established best management practices to control them as appropriate.

Monitoring and Abating Wildlife and Plant Diseases

The Service has not yet published its manual chapter on Disease Prevention and Control. In the meantime, we derive guidance on this topic from the Refuge Manual and specific directives from the Director of the Fish and Wildlife Service or the Secretary of the Interior. The Refuge Manual (7 RM 17.3) lists three objectives for the prevention and control of disease.

1. Manage wildlife populations and habitats to minimize the likelihood of the contraction and contagion of disease.

2. Provide for the early detection and identification of disease mortality when it occurs.
3. Minimize the losses of wildlife from outbreaks of disease.

Chronic wasting disease (CWD) is a disease of concern for many refuges in the Northeastern states. According to the Chronic Wasting Disease Alliance, CWD is a transmissible neurological disease of deer and elk that produces small lesions in brains of infected animals. It is similar to mad cow disease in cattle and can be fatal to deer and elk (CWDA 2012). From Sunkhaze Meadows NWR and Carlton Pond WPA, the nearest known location of this disease has been verified in central New York State. Even though this is nearly 400 miles away from the refuge and WPA, the disease has been known to spread rapidly. As of 2012, it has been identified in 19 states across the country. While not currently found within Maine, we continue to monitor the spread of this disease nationally and continue to evaluate the potential for it at both the refuge and WPA.

In addition to diseases that cause serious mortality among wildlife, diseases transmitted through wildlife to humans have received more attention. One example is Lyme disease. In 2002, the Service published a Service Manual chapter (242 FW 5) on Lyme Disease Prevention to inform employees, volunteers, and national service workers about this disease, its prevention, and treatment. Other wildlife diseases may be a concern in the future. While eastern equine encephalitis (EEE) is not currently known to occur within Maine, it has been found in other parts of the Northeast such as Massachusetts, New Jersey, and New York. West Nile virus has been found in localized areas of Maine and Vermont, but most frequent cases of this disease typically occur in southern New England in states like Connecticut, Massachusetts, and New Jersey (CDC 2012). EEE is transmitted by infected mosquitos in and around freshwater hardwood swamps in the Atlantic and Gulf Coast states and the Great Lakes region (CDC 2010). As with other diseases known to occur within the surrounding region, we will continue to monitor the spread of this disease nationally and continue to evaluate the potential for it at both the refuge and WPA.

Biological and Ecological Research and Investigations

The Refuge Manual and the Service Manual both contain guidance on conducting and facilitating biological and ecological research and investigations on refuges. In 1982, the Service published three objectives in the Refuge Manual for supporting research on units of the Refuge System (4 RM 6.2):

1. Promote new information and improve the basis for, and quality of, refuge and other Service management decisions.
2. Expand the body of scientific knowledge about fish and wildlife, their habitats, the use of these resources, appropriate resource management, and the environment in general.
3. Provide the opportunity for students and others to learn the principles of field research.

In 2006, the Service Manual provided supplemental guidance on the appropriateness of research on refuges: “We actively encourage cooperative natural and cultural research activities that address our management needs. We also encourage research related to the management of priority general public uses. Such research activities are generally appropriate. However, we must review all research activities to decide if they are appropriate or not as defined in section 1.11. Research that directly benefits refuge management has priority over other research.” (603 FW 1.10D(4))

All research conducted on the refuge must be consistent with an approved finding of appropriateness and compatibility determination for research. If a research project does not fall within the scope of a current finding of appropriateness and compatibility determination, we would need to complete project-specific evaluations before authorizing the research. Research projects may also contribute to specific needs identified by the refuge or the Service. As we note in chapter 2, we have allowed many research projects that meet these criteria. We expect additional opportunities to arise under any of the alternatives we propose in this draft CCP. A special use permit will be issued for all research projects we allow. In addition, we will employ the following general strategies:

1. Seek qualified researchers and funding to help answer refuge-specific management questions.
2. Participate in appropriate multi-refuge studies conducted in partnership with the USGS.
3. Facilitate appropriate and compatible research by providing compatible access and utilization of the refuge as a location for ongoing research.

Furbearer Management

Under all the alternatives, we would continue to allow trapping on WPA lands and on the Sunkhaze Meadows Unit of the refuge according to refuge and State regulations, as specified in the existing furbearer management plan and EA (USFWS 2001) and compatibility determinations (updated as part of this process). We would continue to conduct furbearer management as a mechanism to collect survey and monitoring information that otherwise would be expensive and difficult to obtain using refuge resources and as a way to collect initial data 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 who participate in the refuge and WPA programs may provide assistance with the implementation of management objectives, such as the alleviation or reduction of wildlife damage conflicts, negative interactions among species, and negative effects of species on habitats.

Protecting Cultural Resources

As a Federal land management agency, we are responsible for locating and protecting all historic resources: specifically, archeological sites and historic structures eligible for listing or listed on the National Register of Historic Places. That applies not only to refuge land, but also to land affected by refuge activities, and includes any museum properties. As discussed in chapter 2, some lands within Sunkhaze Meadows NWR contain known archaeological and cultural resources.

Under all the alternatives, we will evaluate the potential for our management activities to impact archeological and historical resources as required, and will consult with the Service's regional archaeologists, Maine Historic Preservation Commission, and federally recognized tribes as appropriate to ensure compliance with Section 106 of the National Historic Preservation Act and any other applicable laws and regulations, regardless of the alternative implemented. That compliance may require any or all of the following: a survey of State historic preservation records, a literature survey, or a field survey.

Wildlife-dependent Recreational Program

The Refuge System Improvement Act designated six priority public uses on national wildlife refuges: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Per the Service Manual (605 FW 1), we will continue to use the following criteria for a quality wildlife-dependent recreation program in developing refuge programs. According to this policy, quality, wildlife-dependent recreation:

1. Promotes safety of participants, other visitors, and facilities.
2. Promotes compliance with applicable laws and regulations and responsible behavior.
3. Minimizes or eliminates conflict with fish and wildlife population or habitat goals or objectives in an approved plan.
4. Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
5. Minimizes conflicts with neighboring landowners.
6. Promotes accessibility and availability to a broad spectrum of the American people.
7. Promotes resource stewardship and conservation.
8. Promotes public understanding and increases public appreciation of America's natural resources and our role in managing and conserving these resources.
9. Provides reliable/reasonable opportunities to experience wildlife.
10. Uses facilities that are accessible to people and blend into the natural setting.
11. Uses visitor satisfaction to help to define and evaluate programs.

While no formal assessment has been conducted, Service staff and volunteers have observed that most visitors to the refuge and WPA engage in some form of wildlife-dependent recreation. Wildlife observation, fishing, and hunting are the three of the most common activities (see chapter 2, section 2.12). Under all alternatives we will continue to offer opportunities for all six priority uses.

Appropriateness and Compatibility Determinations

Chapter 1 describes the requirements for determinations of appropriateness and compatibility. Appendix B includes appropriateness and compatibility determinations consistent with implementing alternative B, the Service-preferred alternative. Existing findings of appropriateness and compatibility determinations will be updated for the alternative selected under the final CCP. Our final CCP will include all approved findings of appropriateness and compatibility determinations for the alternative selected. These activities will be evaluated based on whether or not they contribute to meeting or facilitating refuge purposes, goals, and objectives. As noted above, environmental education and interpretation, wildlife observation and photography, hunting, and fishing are the priority, wildlife-dependent uses of the Refuge System. According to the Refuge System Improvement Act and the Service Manual (605 FW 1), these uses are automatically considered to be appropriate and should receive preferential consideration in refuge planning and management. Appendix B of the draft CCP and EA includes current drafts of all findings of appropriateness and compatibility determinations for the Service's preferred alternative (alternative B).

Activities Not Allowed

As specified in the Refuge Administration Act, we cannot, "initiate or permit a new use of a refuge or expand, renew, or extend an existing use of a refuge" unless we have determined that the use is compatible. In addition, certain uses are generally or specifically prohibited on refuges

by Service regulation (see 50 CFR 27 for details). Federal regulations for WPAs are different. As specified in 50 CFR 31.16, 32.1, and 32.4, WPAs are open to hunting, fishing, and trapping unless closed. However, WPAs are closed to other public uses unless opened. The refuge and WPA are closed to public uses except those specified. According to Service policy (603 FW 1), if the refuge manager finds a use is not appropriate, it can be denied without determining its compatibility. We are not required to formally document all activities that are not found to be appropriate; however, if a use is requested frequently by several individuals or organizations we may choose to prepare a finding of appropriateness and compatibility determination if warranted. Historically, we have received requests for activities that are typically not allowed on refuges or WPAs (e.g., ice skating, firewood and peat harvesting at Sunkhaze Meadows Unit). Other areas nearby or elsewhere provide most of these activities, so the lack of refuge or WPA access does not eliminate opportunities for these activities within the region.

Activities Allowed

As part of the CCP process, we have reviewed all existing public uses of the refuge and WPA. In addition to the six priority public uses, we have determined that several other existing public uses are appropriate and compatible on refuge and WPA lands under certain conditions. These nonpriority public uses include: boating; skiing and snowshoeing; snowmobiling on designated trails (Sunkhaze Meadows NWR Units only); gathering of blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds for personal use; dog walking on trails (Sunkhaze Meadow Unit only); limited dog trials (Carlton Pond WPA only); and certain types of scientific research conducted by non-Service personnel. Authorized scientific research conducted by non-Service personnel is expected to contribute to goals 1, 2, 3, and 6. It is subject to Refuge Manual (4 RM 6.2) and Service Manual (603 FW 1.10D(4)) guidance on allowing research on Refuge System lands. Please see the compatibility determination for this use in appendix B for additional information. The other nonpriority public uses contribute to goals 3, 4, and 5 of this document, and support commitments we made in the refuge's establishing documentation that we would allow certain traditional uses of the refuge, if compatible (USFWS 1988). Boating, skiing, and snowhoeing also facilitate visitor participation in priority public uses during certain times of year.

Regardless of the alternative, we will continue to allow all six priority public uses and the existing, compatible public uses outlined above. Details on how we would administer the six priority public uses and scientific research are described under each alternative. How we would continue to administer boating; skiing, snowshoeing, gathering of berries, antlers etc. for personal use; dog walking on trails (Sunkhaze Meadow Unit only); and limited dog trials (Carlton Pond WPA only) would not vary by alternative and are described below. Additional details on all of these authorized public uses and how we would administer them are also available in appendix B.

We will continue to:

- Allow limited dog trials in a small area of Carlton Pond WPA no more than 4 days a year.
- Allow recreational boating on Carlton Pond WPA waters and the Sunkhaze Meadows Unit of Sunkhaze Meadows NWR.

- Allow visitors to gather, for personal use only, blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds at Sunkhaze Meadows NWR.
- Allow motorized and non-motorized boating on Sunkhaze Stream, its tributaries, and Carlton Pond.
- Allow cross-country skiing and snowshoeing, on and off trail, at all units of Sunkhaze Meadows NWR and Carlton Pond WPA.
- Allow dog walking on trails at the Sunkhaze Meadows Unit only.
- Allow use and maintenance of about 6 miles of snowmobiling trails at the Sunkhaze Meadows Unit, Benton Unit, and Sandy Stream Unit of Sunkhaze Meadows NWR through a special use permit to local snowmobile organizations.

Refuge and WPA Staffing and Administration

Our proposals in this document do not constitute a commitment for staffing increases or funding for operations, maintenance, or future land acquisition. Congress determines our annual budgets, which the Service's national headquarters and regional offices distribute to the field stations.

Permanent Staffing and Operational Budgets

Permanent staffing and operational budgets for the refuge and WPA are subject to the annual discretion of the Service's Northeast Regional Chief of the National Wildlife Refuge System and allocations provided through the Federal budget. As noted in chapter 2, section 2.8, Sunkhaze Meadows NWR and Carlton Pond WPA have been unstaffed as of 2008. In all the alternatives, Sunkhaze Meadows NWR and Carlton Pond WPA will continue to be administered and supported, at least in part, by staff at Maine Coastal Islands NWR Complex.

In all the alternatives, our objective is to achieve levels of annual funding and staffing that allow us to achieve refuge purposes, as described by the goals, objectives, and strategies that we will establish in the final CCP. Implementing the described management actions will be dependent on the level of staffing available over the 15-year life of the CCP. Appendix E identifies current and proposed staffing levels.

Facilities Construction and Maintenance

Some minor infrastructure including observation platforms, boardwalks, and trails will continue to be maintained (to varying degrees) under each alternative.

Previous owners of refuge lands at the Sunkhaze Meadows Unit authorized five leases for private cabins. Four of these cabins are no longer used by the former occupants, and we have purchased the cabins. We will continue to maintain two of these buildings at the Sunkhaze Meadows Unit to store refuge equipment and provide work space for refuge staff and occasional use by the Friends of Sunkhaze Meadows. We do not believe the remaining buildings are needed to support current or future refuge management actions or programs.

We intend to renew the annual agreement with a private citizen allowing access to and use of the one remaining cabin, provided the agreement remains in good standing. Maintenance of the cabin will continue to be the sole responsibility of the owner; the Service will not be responsible for any maintenance on this building. Once the agreement is terminated, we would acquire

interests in this last cabin as needed. We will not enter into any additional agreements allowing private use of refuge cabins.

There are no Service buildings on the other units or Carlton Pond WPA. We will continue to maintain the dam at Carlton Pond WPA.

Distributing Refuge Revenue Sharing Payments

As discussed in chapter 2, we pay local municipalities annual refuge revenue sharing payments based on the number of acres in each municipality and the appraised value of refuge lands in their jurisdiction. All of the alternatives would continue these payments as long as they are authorized by the Revenue Sharing Act or other legislation, commensurate with changes in the appraised market value of refuge lands and new appropriation levels dictated by Congress.

Refuge and WPA Operating Hours

All of the alternatives include keeping the refuge and WPA open for authorized public uses from official sunrise to sunset, 7 days a week. Additionally, the refuge and WPA maintains extended hours specifically for hunting access: a half hour both before sunrise and a half hour after sunset. They are also open to night hunting of coyote and raccoon per refuge and State regulations. In addition, the refuge manager has the authority to issue special use permits to allow access outside those periods. For example, we may permit access for research personnel or organized groups to conduct nocturnal activities such as wildlife observation, and educational and interpretive programs.

Completing a Wild and Scenic Rivers Review

The Wild and Scenic Rivers Act (Public Law 90-543 as amended: 16 U.S.C. 1271 through 1287) established a method for providing Federal protection for free-flowing rivers that possess one or more “outstandingly remarkable” natural or cultural values, and are judged to be of more than regional or local importance. A wild and scenic river designation preserves these rivers and their immediate environments for the use and enjoyment of present and future generations. Wild and scenic river designation seeks to protect and enhance a river's current condition; therefore, current uses and activities are incorporated into the review process and are generally allowed to continue.

Similar to the wilderness review, as part of the CCP process, we are required to consider rivers and streams within the refuge and WPA boundaries for inclusion in the National Wild and Scenic River System. The process for recommending rivers for inclusion in the National Wild and Scenic River System has three steps: eligibility, classification, and suitability. Our review only applies to rivers and streams within the refuge and WPA boundaries. Also, because of time constraints, our review only includes the first two steps, determining eligibility and a tentative classification. Our findings of river eligibility and classifications assigned during this review are subject to further consideration during the study phase which we will complete after the CCP.

Based on our analysis, we determined that Sunkhaze Stream and its tributaries meet the criteria for wild and scenic river eligibility and we have tentatively classified these as scenic under the act. We will need to complete the study phase, including additional public review, to determine final classification and suitability. If we determine these waters are suitable for designation under

the Wild and Scenic Rivers Act, we will make a recommendation to Congress. Only Congress may act to designate rivers or segments as wild and scenic under this act.

Once a river or river segment is found eligible by an agency, the agency must evaluate any subsequent actions within its jurisdiction to ensure the actions do not affect potential wild and scenic river designation. In other words, for Sunkhaze Stream and its tributaries, we need to ensure that Service activities do not affect the characteristics of the stream that make it eligible for designation. We do not expect the results of the review process, or designation if it occurs, to affect any of the existing public uses or proposed habitat management of the refuge's or WPA's lands or waterways. For more details, please see the wild and scenic river review (appendix F).

Monitoring and Enforcing Farmers Home Administration Easements

As discussed in chapter 1, from the late 1980s to the mid-1990s, the Farmers Home Administration (FmHA) acquired many properties throughout the country through foreclosure sales. Before reselling the properties, the FmHA placed permanent conservation easements on most of these properties to protect important habitats. The responsibility for monitoring and enforcing those easements and managing the retained properties rests with the Service, which has usually delegated it to the manager of the closest refuge.

Sunkhaze Meadows NWR currently administers four FmHA easements. Under all of the alternatives presented herein, the responsibility for administering these properties is expected to remain with the refuge manager responsible for managing Sunkhaze Meadows NWR. Currently, refuge staff check on Service interests in these properties once a year, additional visits may be made, in response to land owner calls. Routine annual visits usually take 3 staff days. It is difficult to predict how much additional time and effort will be required to administer these interests in the future.

We will continue to implement the following strategies to meet our obligations on FmHA properties:

- Respond to reports of violations or possible violations as we learn of them. Work with landowners and partners to cooperatively resolve and remedy any violations. If necessary, work with the Northeast Region Solicitor's Office or Assistant U.S. Attorney's Office to ensure remediation and future compliance.
- Have refuge staff, typically the law enforcement officer, check on Service interests in these lands once per year.

Completing Refuge and WPA Step-down Plans

Service planning policy identifies up to 25 step-down plans that may be applicable on any given refuge. The refuge and WPA's existing step-down plans are summarized previously in Chapter 1, Section 1.5, Conservation Plans and Initiatives Guiding the Proposed Action.

Under all alternatives, we have identified a few of these step-down plans that we consider to be of highest priority for updating or completing after the CCP is finalized. In particular, we will update the Fisheries Management Plan and Hunting Management Plan within 5 years of completing the CCP. We will also revise and finalize the HMP after we complete the final CCP. We will also develop annual habitat work plans and an inventory and monitoring plan to assist us

in addressing CCP objectives and measuring our progress. To keep them relevant, we will modify and update them as we obtain new information. Below is a more detailed description of the HMP, annual habitat management plan, and inventory and monitoring plans. The completion of these plans supports all refuge goals.

Habitat Management Plan

A habitat management plan for the refuge is the first step toward achieving the habitat-based goals and objectives, regardless of the alternative selected for implementation. For example, this plan will incorporate the selected alternative's habitat objectives developed herein, and will identify specific "what, which, how, and when" actions and strategies would be implement over the 15-year period to achieve those objectives. Specifically, the habitat management plan will define management areas and treatment units, identify the type or method of treatment, establish the timing for management actions, and define how we will measure success over the next 15 years. In this CCP, the goals, objectives, and strategies in each objective identify how we intend to manage habitats on the refuge. We base both the CCP and HMP on current resource information, published research, and our own field experiences. We will update our methods, timing, and techniques as new, credible information becomes available. To facilitate our management, we will regularly maintain our GIS database, documenting any major changes in vegetation as needed. As appropriate, we will incorporate the actions common to all alternatives into the habitat management plan.

Annual Habitat Work Plan and Inventory and Monitoring Plan

The annual habitat work and inventory and monitoring plans for the refuge are also priorities for completion upon CCP approval. Regardless of the alternative chosen, these plans are vital for implementing habitat management actions and measuring our success in meeting the objectives. Each year, we will generate an annual habitat work plan based on the habitat management plan. The annual habitat management plan will outline specific management activities for that year. The inventory and monitoring plan will outline the methodology to assess whether our original assumptions and proposed management actions support our habitat and species objectives. We will prioritize our inventory and monitoring needs in this plan. The results of inventories and monitoring will provide us with more information on the status of our natural resources and allow us to make more informed management decisions.

Additional NEPA Analysis

For all major Federal actions, NEPA requires the site-specific analysis and disclosure of their impacts, either in an environmental assessment (EA) or in an environmental impact statement (EIS). NEPA categorically excludes other, routine activities from that requirement. Generally, those include the administrative actions listed in chapter 4.

Most of the major actions proposed in the three alternatives and fully analyzed in this draft CCP and EA are described in enough detail to comply with NEPA, and would not require additional environmental analysis. Although this list is not all-inclusive, the following projects fall into that category:

- Completing the habitat management plan, including its specified restoration projects and habitat management programs (provided no major changes from the CCP).
- Completing the inventory and monitoring plan.

- Controlling invasive plants.
- Implementing a predator or pest management program.
- Constructing small kiosks, signs, parking areas, and other small-scale visitor facilities.
- Enhancing our priority public use programs.

The refuge's fire program (including all three refuge units and Carlton Pond WPA) went through a separate NEPA process in 2001. At that time, the fire management plan and associated EA were completed (USFWS 2001). The fire management plan is in the process of being updated.

Actions Common to Alternatives B and C

The Service proposes a series of similar management actions under alternatives B and C. These are actions determined to be important for future management under each of these alternatives, but that are not part of current management (alternative A).

Adaptive Management

All of the alternatives will include some flexibility in management to allow us to respond to new information, spatial and temporal changes and environmental events, whether foreseen or unforeseen, or other factors that influence management. The need for flexible management is very compelling today because our present information on refuge species and habitats is incomplete, provisional, and subject to change as our knowledge base improves.

Adaptive management requires formulating predictions about habitat or species responses to management actions, implementing management actions, and then monitoring to determine if species or their habitats are responding as predicted. Secretarial Order No. 3270 provides guidance on policy and procedures for implementing adaptive management in departmental agencies. In 2007, an intradepartmental working group developed a guidebook to assist managers and practitioners. This adaptive management guidebook was updated in 2009 (Williams et al. 2009). It defines adaptive management, the conditions under which we should consider it, and the process for implementing it and evaluating its effectiveness. The guidebook defines adaptive management as, "a decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood."

For the refuge, monitoring key resources and management actions and outcomes, would be critical to implementing an adaptive management process. It is designed to facilitate more effective decisions and enhanced benefits. Habitat management to benefit showy lady's slipper or the northern white cedar exemplary plant community are examples of refuge activities where an adaptive management approach would be implemented and refined under alternatives B and C. The refuge manager will be responsible for changing management actions and strategies if they do not produce the desired conditions. Significant changes in management actions from what we present in our final CCP may warrant additional NEPA analysis and public comment.

Generally, we can increase monitoring and research that support adaptive management without additional NEPA analysis. Our inventory and monitoring plan will determine future survey

efforts and prioritize inventory and monitoring efforts (see “Annual Habitat Work Plan and Inventory and Monitoring Plan” under “Completing Refuge Step-down Plans” below).

Expand Partnerships to Achieve Management Needs

The Service would expand its involvement in partnerships with State, Tribal, and local agencies and organizations, as well as academic institutions, to achieve its management goals. Under both alternatives B and C, we would explore partnership opportunities to inventory use of habitat by reptiles, amphibians, and priority birds of conservation concern as well as monitor or research variables related to climate change on Service-owned lands.

Under these alternatives, refuge staff would work with Moosehorn NWR staff, Umbagog NWR, MDIFW, town representatives, and members of the Penobscot Indian Nation and other Tribes as warranted collaborating on natural resource and public use management.

Establish Climate Change Monitoring Protocols

There is consensus among the scientific community that global climate change, occurring in part as a result of emissions of carbon dioxide and other greenhouse gases from human activities, will lead to significant impacts across the U.S and the world (National Academies 2005). We discuss the potential effects of climate change on refuge and WPA resources in chapter 2, under Climate.

Uncertainty about the future effects of climate change requires refuge managers to use adaptive management to maintain healthy ecosystems in light of unpredictability (Inkley et al. 2004). This involves improving or adjusting policies and practices based on the outcomes of monitoring or management activities and may result in changes to regulations, shifts in active habitat management, or changing management objectives. Refuge managers can plan and respond to changing climate conditions. A few recommendations include managing for diverse and extreme weather conditions (e.g., drought and flood) and maintaining healthy, connected, genetically diverse wildlife populations (see Inkley et al. 2004).

Under alternatives B and C, the Service proposes establishing baseline monitoring protocols that would allow us to evaluate climate change impacts over time. These protocols may track the status of habitats, individual species, or ecological processes over time. The exact protocols will be developed based on available data, climate change projections, and availability of funding and expertise. In conjunction with the partnerships emphasis noted under subsection 3.4.1, the Service will explore partnership opportunities to monitor or research variables related to climate change on Service-owned lands.

Expand Cultural Resource Protection and Interpretation

Recent cultural resource surveys conducted by the University of Maine in Orono identified known and potential locations of cultural resource areas requiring protection and preservation at Sunkhaze Meadows Unit (Robinson 2012). At this time, no management actions are proposed that we believe would impact known or suspected cultural resources. The Penobscot Indian Nation has expressed interest partnering with us in the future management of Sunkhaze Meadows Unit to ensure protection of cultural resources and interpretive opportunities available at that site. Under alternatives B and C, the Service would use results from the cultural resource overview to develop a step-down cultural resource management plan. This plan will outline

considerations for the ongoing protection of cultural resources on Service lands as well as identify opportunities for expanding cultural resource interpretation both on and off refuge.

Activities Allowed

As discussed under Actions Common to All Alternatives, we would continue to allow all six priority public uses as well as boating; skiing and snowshoeing; snowmobiling on designated trails (Sunkhaze Meadows NWR Units only); gathering of blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds for personal use; dog walking on trails (Sunkhaze Meadow Unit only); limited dog trials (Carlton Pond WPA only); and certain types of scientific research. See our discussion under Actions Common to All Alternatives regarding these activities.

Under alternative B and C, we would open Sunkhaze Meadows NWR to the following additional public uses: bicycling (Sunkhaze Meadows Unit only); geocaching; orienteering; and commercial guiding for priority public uses. We anticipate that opening the refuge to bicycling, orienteering, and commercial guiding would support participation in priority public uses or improve visitor safety, or possibly both. Geocaching, as described in the draft compatibility determination in appendix B, is expected to be a low-impact activity that potentially introduces a new audience to the refuge and the Refuge System, broadening public understanding and support for both. Additional details on these proposed uses are presented under goals 4, 5, and 6 of alternatives B and C, and in appendix B.

The current snowmobile trail runs through the middle of the Sandy Stream Unit. Under alternatives B and C we would work with the local snowmobile club to relocate the snowmobile trail at the Sandy Stream Unit. It would be closer to Prairie Road, as described in alternative B under objective 3.4, to reduce habitat fragmentation and maximize the riparian buffer width along Sandy Stream itself.

In addition to the strategies discussed under Actions Common to All Alternatives, we would:

- Open Sunkhaze Meadows NWR to geocaching, orienteering, and commercial guiding for priority public uses.
- Work with local snowmobile clubs to relocate the snowmobile trail at the Sandy Stream Unit closer to Prairie Road (see map 3.14).

Facilities Maintenance

As discussed under Actions Common to All Alternatives, we would continue to maintain two cabins for storage and other uses. Under alternatives B and C we would remove the remaining two cabins we currently own. We do not need these structures and it is wise practice to remove unused buildings that are not needed rather than let them deteriorate and invite vandalism. If we acquire interests in the remaining privately-owned cabin, we will determine whether to maintain or remove the structure after assessing its condition and refuge needs.

Only non-essential structures, including unused cabins and building remnants, would be eliminated from refuge lands. Also, alternatives B and C would include identifying and acquiring an appropriate site for refuge management facilities on or near the Sunkhaze Meadows Unit.

Alternative A. Current Management (Continuing Current Management)

Alternative A satisfies the NEPA requirement of a "no action" alternative, which we define as "continuing current management." It describes our existing management priorities and activities, and serves as a baseline for comparing and contrasting alternatives B and C. Alternative A describes current projects planned, funded, or underway, and serves as a baseline for comparisons among the alternatives.

Habitat management under alternative A would continue to be largely based on preservation, with minimal active management occurring across refuge or WPA lands. This management would be driven in part by the intact ecological integrity of many habitats found on refuge lands, but would also be the unintended result of the lack of staffing at the refuge.

Visitor services under alternative A would continue to be minimal. Several wildlife observation trails, access points, and snowmobiling trails exist on refuge lands and are largely maintained by volunteer organizations and individuals. Service staff support public uses such as environmental education and interpretive programming, hunting, and trapping to the extent possible.

Staffing at Sunkhaze Meadows NWR and Carlton Pond WPA would remain the same as the current existing conditions. Maine Coastal Islands NWR Complex staff would continue to dedicate approximately 5 percent of their time annually to administer and manage the Sunkhaze Meadows NWR and Carlton Pond WPA. Their efforts would continue to be supported by an annual maintenance budget of $5,800.

The maintenance of buildings and facilities would remain the same as current existing conditions. Law enforcement presence would be maintained at the current level of 2 days per week at Sunkhaze Meadows NWR and Carlton Pond WPA, using law enforcement staff from Maine Coastal Islands NWR Complex.

In the discussion that follows, we describe in detail the goals, objectives, and strategies that we will continue to implement under alternative A.

Goals, Objectives, and Strategies under Alternative A

Goal 1. Sunkhaze Meadows Biological Management. Promote the environmental health of Sunkhaze Meadows Unit wetland, forest, and aquatic habitats to protect water quality and sustain native rare plants, natural communities, and wildlife, including species of conservation concern.

Objective 1.1 Sunkhaze Meadows Unit: Freshwater Wetland -- Peatland Complex

Conserve the 3,461-acre freshwater wetland-peatland complex on Sunkhaze Meadows Unit that includes open water, marsh, beaver marsh, and shrub swamp to protect and buffer the ecological integrity of the 1,649 acres of peatland, protecting water quality, rare plants, and habitat for American black duck and other breeding waterfowl, bitterns, sedge wren, yellow rail, rusty blackbird, and other wetland-peatland dependent-species.

Rationale
With 3,461 acres of contiguous freshwater-peatland wetland, this diverse wetland complex includes a mix of open water and emergent marsh communities, along with the unique peatland system. Davis et al. (1983) ranked Sunkhaze Meadows' peatlands high in ecological value among 31 other peatlands in Maine based on its developmental-morphological diversity, pristine character, and exemplary quality of peatland type or feature. It is the second largest peatland in the State (MNAP 2011). Protecting this peatland system was the primary purpose for the establishment of Sunkhaze Meadows NWR.

The peatland-wetland complex is just part of the diverse mix of natural communities and habitats on this unit (see map 3.1). An exemplary floodplain forest lies next to the peatland, Sunkhaze Stream meanders through a portion of this habitat, and the wetland complex is surrounded by a mix of wetland and upland forest. One of the current potential threats to the integrity of the Sunkhaze Meadows Unit's peatland-wetland complex is expansion of invasive species populations. The impacts of invasive species have been described previously under the section titled Actions Common to All Alternatives. The ecological features of the peatland-wetland complex are described in more detail under alternative B, objective 1.1.

With current resources, management activities are limited to treating invasive species as opportunities arise. No other habitat management or monitoring currently occurs in the peatland-wetland complex.

Strategies
Continue to:
- Allow natural processes to maintain wetland system in this unit.
- Control invasive species infestations, such as purple loosestrife, as opportunities arise.

Objective 1.2 Sunkhaze Stream and Aquatic Habitats

Preserve the 17 miles of Sunkhaze Stream and its tributaries that flow through the unit to protect the water quality and biological integrity that sustains native brook trout, Atlantic salmon and other aquatic organisms, wood turtle, and breeding and migrating birds.

Rationale
The Sunkhaze Meadows Unit encompasses 5 miles of the approximately 20-mile Sunkhaze Stream, which bisects the refuge along a northeast to southwest orientation. The refuge includes another 16 miles of tributary streams that include Buzzy, Little Buzzy, Baker, Dudley, and Johnson Brooks, and Birch and Little Birch Streams (see map 3.1). Upstream of refuge property, a series of riffles and falls separated by long stretches of slow meandering water supports some of the most important brook trout fisheries in the Bangor area (Rupp 1955, Stockwell and Hunter 1983, Smithwood and McKeon 1999).

Beavers are active in the Sunkhaze Meadows Unit wetland system. Beaver ponds are attractive to many species of dabbling duck, particularly American black duck and wood duck, as well as other waterfowl, waterbirds, raptors, songbirds, mammals, amphibians, and reptiles. The effects of beavers on brook trout vary. Beavers may negatively affect brook trout in lowland streams by inhibiting passage up or downstream, inducing sedimentation, and causing increases in water

temperatures (Salyer 1935; Reid 1952; Knudsen 1962). However, brook trout may benefit from increased food resources in beaver ponds (Rupp 1954). Pollack et al. (2003) describe how most studies support the idea that beaver dams and their ponds are highly beneficial to many fish species. Similarly, several other studies have shown that many aquatic species regularly cross beaver dams in both upstream and downstream directions (Rupp 1954; Huey and Wolfrum 1956; Gard 1961; Hanson and Campbell 1963; Call 1970; Bustard and Narver 1975; Swales et al. 1988; Murphy et al. 1989; Keast and Fox 1990; Leidholt Bruner et al. 1992; Schlosser 1995; Snodgrass and Meffe 1998, 1999).

Due to the current lack of staffing at Sunkhaze Meadows Unit, no habitat management or monitoring currently occurs within the streams and associated habitats.

Strategies

Continue to:

- Allow natural processes to maintain the water quality and biological integrity of Sunkhaze Stream and its tributaries.
- Respond to reports of invasive species as needed.

Objective 1.3 Sunkhaze Meadows Unit: Northern White Cedar Woodland Fen

Preserve the 390-acre exemplary northern white cedar woodland fen at Sunkhaze Meadows Unit, to benefit the State-threatened showy lady's slipper and species of conservation concern.

Rationale

As discussed in chapter 2, the MNHP has designated the northern white cedar woodland fen on the Sunkhaze Meadows Unit as an exemplary plant community (MNAP 2010). At Sunkhaze Meadows Unit, this habitat contains a very dense stand of small cedar trees with an average diameter of less than 5 inches (MDIFW 2005). Northern white cedar is a long-lived, shade tolerant species, but browsing by white-tailed deer and snowshoe hare can limit the regeneration of northern white cedar seedlings. At the nearby Penobscot Experimental Forest, researchers observed extensive browsing on cedars by deer (Larouche et al. 2010). The showy lady's slipper a State-listed threatened plant occurs in the same area as the northern white cedar. An active deer yard also covers much of the same area (see map 3.1).

Strategies

- Continue to allow natural disturbances and natural plant succession to maintain the northern white cedar woodland fen.

Objective 1.4 Sunkhaze Meadows Unit: Conifer and Northern Hardwood-Mixed Forests

Preserve 2,904 acres of conifer and 5,000 acres of northern hardwood mixed forests on the Sunkhaze Meadows Unit as a self-sustaining, late successional forest characteristic of the Atlantic northern forest, to benefit species dependent on these late successional habitats.

Rationale

Although there are large tracts of privately owned forest land in the region, very little, if any, old-growth forest remains outside refuge boundaries. Old forests and their associated features are

declining globally. In Maine, old-growth forest accounts for about 4 to 6 percent of the State's forestland (Cutko 2009). Estimates of pre-settlement forests suggest that 50 percent or more of Maine supported stands over 150 years old (Lorimer 1977). Economic pressures make it difficult for private landowners to retain or restore late successional conditions (Whitman and Hagan 2007). The refuge can fulfill an important role by providing these late successional stages (i.e., older forests) that are significantly under-represented in the region.

Late successional and old growth forests are important to conserving forest biodiversity. They contain forest features not found in young forests including large trees, snags and logs, large amounts of dead wood, and diverse vertical structure (Whitman and Hagan 2007). While many of the bird species of conservation concern in the northeast are not entirely dependent on late successional or old growth forest, some bird species may have higher abundances in older forests (Hagan and Grove 1999). There are other types of at-risk species that are dependent on the habitat features found in older forests. These tend to be species such as mosses, fungi, lichen, and insects (Hagan and Whitman 2003). In addition, older forests have ecological processes that are mostly absent from young forests, such as trees and roots tipped over and torn up by winds (Whitman and Hagan 2007). Therefore, a management emphasis on late successional forest is important to sustaining the biological integrity, diversity, and environmental health of the Atlantic northern forest region since it provides an important component largely missing from the landscape at present.

Strategies

Continue to:

- Allow natural disturbances and natural plant succession to maintain this forested habitat.
- Use mechanical, biological, chemical and prescribed fire, as appropriate, to control invasive plants. The control method varies by invasive species and should follow recommendations by invasive species subject matter experts. Ice storms, strong winds, insect and disease outbreaks all cause damage to forest health and contribute to unnatural or excessive buildup of dead, woody vegetation at the surface, increasing the risk of a damaging wildfire. When these events occur, consult with regional fire staff for ways to mitigate risks and restore forest health.

Objective 1.5 Sunkhaze Meadows Unit: Early Successional Habitat

Support up to 119 acres of young forest habitat on the Sunkhaze Meadows Unit. Young forest habitat is characterized by a mix of native tree saplings between 3 to 40 years old with an average height of between 5 to 25 feet.

Rationale

Two electric companies have existing right-of-ways for transmission lines that transects the western portion of the Sunkhaze Meadows Unit; the companies are mandated by the Federal Energy Regulatory Commission to manage this area to keep tall vegetation out of the power lines which results in approximately 107 acres of early successional habitat comprised largely of speckled alder, white ash, and sweet gale. Another 10 acres of this habitat type includes a refuge access road corridor and old log landings. The remaining 2 acres are divided into two American woodcock demonstration plots near the Johnson Brook Trail.

Early successional habitats include a range of habitat types depending on their age and disturbance frequency: from grassland dominated by non-woody species, to shrublands dominated by various shrubs and small trees, to young forests (typically less than 40 years old) dominated by small trees less than 40 feet tall (Whitman and Hagan 2007). While early successional wildlife habitats have become rare in much of the eastern U.S. (Trani et al. 2001), and the Northeast (Brooks 2003), the proportion of early-successional habitat in northern industrial forests (such as those commonly found around the refuge and WPA) is currently several times that which occurred in presettlement times (Lorimer and White 2003). Historically, early successional habitat was created by natural disturbances such as flooding, beaver activity, severe storms, landslides, insect outbreaks, treefalls, and fire. These communities sometimes occur as a relatively short-lived vegetation stage after natural disturbance, agricultural abandonment, or logging (Rosenberg and Hodgman 2000).

Research conducted by Anderson (1999) and others suggests that even in preserved areas, early successional habitat (which may include areas of shrublands and grasslands) may account for as much as 25 percent of the cover resulting from natural disturbances, particularly in softwood-dominated stands that are subject to spruce budworm, wind events, and beaver inundation (Cutko 2009). Seymore et al. (2002) noted that “most such disturbances will occur regardless of human activity.” These young forest conditions scattered throughout a matrix of older forests would also be used by bird species that are linked to mature forest, as they often forage for insects and other food sources in these openings. Most migratory birds rely on seeds, fruits, and insects to sustain them through migration. Opportunities to manage shrub and young forest habitat to increase seed, fruit and insect production would be an important consideration.

The transmission line right-of-ways present on Sunkhaze Meadows Unit comprise the majority of early successional habitat (107 of the 119-acre total) available on the Sunkhaze Meadows Unit. The right-of-ways are maintained by two electric companies in order to distribute electricity to consumers within central Maine. Tree contact with transmission lines is a leading cause of electric power outages and a common cause of past regional blackouts, including the August 2003 blackout that affected 50 million people in the Northeast and Canada. Following the 2003 blackout and subsequent federal legislation, the Federal Energy Regulatory Commission issued standards to ensure the reliability of the Bulk Power System. These standards included standards that address reliability through vegetation management covering tree trimming on rights-of-way (FERC 2012). These regulations require the regular removal of tall-growing trees within electric transmission right-of-ways by utility companies. Because of this, we understand that the 107-acre right-of-way at Sunkhaze Meadows will be regularly cleared. This regulatory requirement understandably limits our ability to manage early successional young forests for conservation species of concern.

American woodcock is a species of highest conservation priority in BCR 14 (Dettmers 2006). There was no significant 10-year population trend for woodcock in the Eastern Region during 2001 to 2011; however, there is a long-term declining trend of -1.0 percent per year between 1968 and 2011 (Cooper and Parker 2010). Woodcock require several different habitat conditions that should be in close proximity to one another. These habitat conditions can consist of both uplands and forested or shrub wetlands. These include clearings for courtship (singing grounds), large openings for night roosting, shrub (especially alder) and seedling or sapling stands (0 to 15

years) for foraging, and young, second-growth hardwoods or mixed woods (15 to 30 years) for nesting, feeding, and brood-rearing (Sepik et al. 1981, Keppie and Whiting 1994).

In addition to woodcock, other BCR 14 priority bird species associated with early and mid-successional hardwood stands on the refuge include the chestnut-sided warbler, black-throated blue warbler, American redstart, rose-breasted grosbeak, black-billed cuckoo, veery, whip-poor-will, ruffed grouse, and northern flicker. Priority bird species associated with early and mid-successional softwood stands include the Canada warbler, yellow-bellied flycatcher, olive-sided flycatcher, and purple finch (Dettmers 2006). These species would benefit from the management habitat under the power line and from early and mid-successional habitat created through natural disturbances on the refuge.

Strategies

Continue to:

- Coordinate as needed with the electric companies as they maintain their existing 107-acre right-of-ways for the transmission lines that traverse the refuge.
- Maintain the two current American woodcock demonstration plots, totaling 2 acres, near the Johnson Brook Trail by mowing or burning approximately every 15 years.
- Allow natural disturbances and natural successional processes to create a continuum of successional habitat, including a component of early successional conditions elsewhere on the unit.

Goal 2. Carlton Pond WPA Biological Management. Promote the environmental health of forest, open water, and emergent wetland habitat at Carlton Pond WPA to benefit waterfowl and sustain a diversity of wildlife including species of conservation concern.

Objective 2.1 Carlton Pond WPA: Open Water – Emergent Marsh

Manage the 783 acres of open water (295 acres) and emergent marsh (455 acres) habitat dominated by pickerel weed, pond lily, and water lily, and the 34 acres of treed peat bog on the Carlton Pond WPA to sustain the nesting population of State endangered black terns and provide breeding habitat for American black duck, and a diversity of other migratory bird species of conservation concern.

Rationale

Nationwide, the Refuge System has acquired nearly 3,000 waterfowl production areas covering 668,000 acres nationwide. Carlton Pond WPA is the eastern-most waterfowl production area in the nation; nearly 95 percent of WPA's are located in the prairie wetlands. While waterfowl production areas, easements, and national wildlife refuges account for less than 2 percent of the landscape, they are responsible for producing nearly 23 percent of the nation's waterfowl (USFWS 2007).

Carlton Pond WPA supports one of the largest breeding colonies of black terns in Maine, with approximately 24 pairs annually (Gilbert 1995). The black tern has experienced rangewide population declines for unknown reasons and is listed as endangered in Maine. The Maine population is detached from the core of the species range in the prairie-pothole region of the

Great Plains. Black terns nest semi-colonially in large, emergent wetlands and feed their young both insects and fish. Terns select emergent wetlands that are at least 12 acres and prefer wetlands greater than 50 acres (Gilbert 1995). They build nests of sticks and reeds on floating mats of dead vegetation or small mud flats. Flooding and predation on eggs and chicks, not habitat availability, seem to be the limiting factors (McCollough et al. 2003). Therefore, maintaining a stable water level during the tern breeding season is essential to prevent flooding.

Carlton Pond WPA was established because of the high numbers of breeding waterfowl observed there. In particular, American black duck, wood duck, blue-winged teal, ring-necked duck, and common goldeneye are thought to be common. American black ducks prefer shallow, emergent wetlands of reeds, sedges, pondweed, and floating-leaved plants that are rich in invertebrates (Longcore et al. 2000). Maintaining water levels to benefit nesting black terns also supports habitat that benefits the American black duck as well as other species of waterfowl.

A population of the nonnative, invasive purple loosestrife was found at Carlton Pond WPA in 1993. In 1995, the Service initiated a biological control program by releasing *Galerucella pussilla* beetles. Control efforts have continued since then, although not in every year. The beetles are most effective in large infestations of loosestrife. The Carlton Pond loosestrife population may be too small to be effectively controlled by the beetles, although it seems to have contained any spread.

Strategies

Continue to:

- Use the existing water control structure to manage water levels in Carlton Pond to benefit black terns and other native species, particularly during the black tern incubation period from May 25 to July 15.
- Maintain current water control structure and spillway including annual maintenance and certified inspection every 5 years. Keep emergency spillway clear at all times (e.g., cleaning out beaver debris) and keep dike free of woody vegetation.
- Contact Unity College and MDIFW to gather historical waterfowl survey information for Carlton Pond.

Objective 2.2 Carlton Pond WPA: Conifer and Northern Hardwood-Mixed Forest

Preserve the 45 acres of conifer forest and 239 acres of northern hardwood-mixed forest on the Carlton Pond WPA to provide a buffer for emergent wetlands and stopover habitat for migratory birds.

Rationale

The upland mixed forest at Carlton Pond WPA (see map 3.2) provides important habitat and water quality benefits to Carlton Pond itself, by buffering and filtering the effects from surrounding land uses that might be detrimental to water quality. The mature forest provides structural habitat components including large nest and roost trees for raptors such as two nesting pairs of bald eagles (MNAP 2011b).

Strategies

- Continue to allow natural processes to maintain forest habitat at Carlton Pond WPA.

Goal 3. Benton and Sandy Stream Biological Management. Promote the environmental health of forest, grassland, and shrubland habitat at Benton and Sandy Stream Units to sustain a diversity of wildlife, including species of conservation concern.

Objective 3.1 Benton Unit: Grassland Habitat

Manage 95 acres on the Benton Unit as grassland habitat to provide nesting and migratory habitat for grassland dependent species such as bobolink, grasshopper sparrow, and eastern meadowlark.

Rationale

Historically, most of the Northeast was forested, except for a period following European settlement when much of the region was cleared for agriculture and subsequently grasslands and open fields became abundant. In pre-settlement times, permanent, large openings were uncommon, except for selected coastal areas. 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 is becoming more forested (Rothbart and Capel 2006).

Many species of grassland birds require relatively large blocks of habitat for nesting areas. Some species, such as Henslow's sparrow, are not likely to be found in grassland patches of less than 75 acres. Other species will use smaller patch sizes, but grasslands of less than 25 acres generally do not meet the requirements for most grassland nesting birds (Mitchell et al. 2000). Ochterski (2006) and others cite Mitchell et al. (2000) in noting that many hayfields are mowed twice a year (early summer and mid to late summer) for hay and hence are less suitable for ground nesting grassland dependent birds. Although there is uncertainty about the extent of grassland habitat and associated wildlife prior to European settlement, grasslands can provide a desirable contribution to habitat diversity (Jones and Vickery 1997). In addition, the uncertainties presented by climate change and the expected change in species' distributions make conservation of various habitat types, including grasslands, important safeguards to allow species to adjust their ranges and adapt to climate change.

The refuge maintains grasslands at the Benton Unit (see map 3.3) to provide: 1) nesting habitat for bobolink, 2) roosting habitat and areas for courtship displays for woodcock, and 3) migrating and wintering habitat for landbirds such as meadowlarks and sparrows. Maintaining grasslands in a specific area requires active management to prevent natural succession to shrubland and eventually to forest. Most of the grassland bird species (e.g., grasshopper, vesper, and savannah sparrows, and eastern meadowlark) that have declined in the region require 20 acres or more of contiguous grassland habitat (Jones and Vickery 1997). Small grasslands surrounded by forest or shrubland and isolated from each other are unlikely to provide quality nesting and feeding habitat for these birds; however, small forest openings do provide singing grounds for woodcock and foraging areas for a variety of wildlife, including foraging habitat for post-fledging and migrating mature forest birds. Mixed grasses 8 to 12 inches in height provide nesting and feeding habitat for bobolink, savannah sparrow, and other resident and migratory birds, as well as resting and feeding habitat for overwintering birds such as snow buntings, horned larks, and Lapland longspurs (Sibley 2003).

Strategies

Continue to:

- Annually, maintain 75 acres of the existing grasslands through a cooperative farming special use permit.
- Maintain the remaining 20 acres of existing grassland by using prescribed burns or mowing every 3 to 5 years.

Objective 3.2 Benton Unit: Sedge Meadow, Open Marsh, and Riparian Habitats

Maintain 13 acres of sedge meadow dominated by sedges and grasses. This includes 2.4 acres of emergent marsh-open water habitat at the Benton Unit to sustain the quality and natural function of the freshwater wetlands as breeding and migratory habitat for species of conservation concern such as sedge wren, wading birds including bitterns and rails, and other wetland-dependent species.

Rationale

Freshwater wetlands throughout Maine have declined from historic levels following hydropower development, conversion to agriculture, or filling for commercial, industrial and residential development. Inland freshwater wetlands continue to be highly threatened and many of the migratory bird populations that are threatened or declining in the Northeast depends on these wetlands (Gibbs et al. 1991).

The sedge wren, a State-listed endangered species, reaches its northeastern limit in Maine. The sedge wren breeds in freshwater meadows of sedges and grasses, shallow sedge marshes, and in the moist edges of freshwater wetlands. Sedge wrens prefer areas with sedges and grasses averaging 3.5 feet tall, scattered shrubs, with an absence of standing water (McCollough et al. 2003). A sedge wren was recorded for the Benton Unit when it was established in 1990, but has not been documented there since. Sedge wrens can be difficult to identify as they closely resemble other wren species (Herkert et al. 2001). Even though they have not been confirmed since 1990, management has continued to maintain habitat suitable for this species. The sedge wren will use small patches (less than 20 acres) of wet sedge meadow in the midst of a large grassland, as occurs at Benton. Burning and mowing of wet meadows can aid in maintaining suitable habitat but should be implemented after the breeding season ends on August 31.

Shallow freshwater wetlands with an abundance of tall emergent vegetation interspersed with open water are important for bitterns and rails (Lowther et al. 2009). The 1.9 acres of restored wetlands at Benton Unit (see map 3.3) offer foraging habitat for these wading birds and are breeding habitat for other common wetland birds including tree swallows and red-winged blackbirds.

Most of the Benton Unit drains into Fowler Brook, which then flows into the Sebasticook River. The refuge, through its management of the Benton Unit, helps benefit water quality important to downstream aquatic organisms in this system.

Strategies

Continue to:

- Maintain grasslands surrounding the sedge meadow and marsh habitats on the Benton Unit.
- Allow natural processes to maintain sedge meadow and marsh habitats in this unit.

Objective 3.3 Benton Unit: Northern Hardwoods-Mixed Forest and Conifer Forest

Preserve the 155 acres northern hardwood-mixed forest and 71 acres of conifer forest on the Benton Unit to promote a self-sustaining, late successional forest (i.e., dominated by trees greater than 70 years old and more than 16 inches DBH, canopy dominated by shade tolerant species, presence of large logs on forest floor), to benefit a suite of species of conservation concern in BCR 14.

Rationale

Same as alternative A, objective 1.4.

Strategies

- Continue to allow natural processes to maintain the forested area on this unit.

Objective 3.4 Sandy Stream Unit: Shrubland Habitat

Manage up to 39 acres on the Sandy Stream Unit as shrubland habitat to provide nesting and migratory habitat for birds of conservation concern such as American woodcock.

Rationale

The loss and degradation of naturally maintained shrublands has been extensive throughout New England and beyond. Shrubland-associated birds consistently rank near the top of lists of species showing population declines. Of 40 bird species associated with shrubland habitats, 22 are undergoing significant population declines in eastern North America. Shrubland communities are habitat patches with woody plants typically less than ten feet tall with scattered open patches of grasses and forbs. Patches dominated by shrub clones (e.g., alder and dogwood) are relatively stable and can last up to 40 years with little management (Tefft 2006). Vegetation structure, microhabitat conditions, and landscape context are the most important habitat features for shrub-dependent birds, rather than specific plant species (Dettmers 2003). Other priority bird species would also benefit from the management objective to maintain native shrublands, particularly during fall migration, including American woodcock, willow flycatcher, eastern towhee, and Canada warbler.

Coastal states have the primary responsibility for most of the native shrubland habitat in the region (Dettmers 2003, Litvaitis 2003); therefore, restoration and maintenance of naturally occurring shrublands is recommended as a priority for coastal states. Managing small patches (less than 25 acres) as shrubland habitat can be more effective for many of the shrubland breeding birds than managing such relatively small patches for other habitat types such as grassland or forest because of the relatively low patch size sensitivity exhibited by many shrubland birds compared to some of the grassland and forest birds.

Given the small size of the Sandy Stream Unit, managing for shrubland habitat is expected to provide the most benefit for priority species of conservation concern. The current condition and site capability lends itself to maintaining shrubs and small trees including speckled alder, gray birch, willows, and hawthorn, among others. The site is also relatively free of invasive plant species.

Strategies

Continue to:

- Maintain shrubland habitat and control nonnative, invasive plants on the Sandy Stream unit using a variety of habitat management methods such as prescribed burns, herbicide treatment, and brush cutting.

Objective 3.5 Sandy Stream Riparian Habitat

Maintain the existing 19 acres of forested riparian buffer (about 25 feet wide) along Sandy Stream to protect the water quality and biological integrity that sustains native brook trout, rare freshwater mussels, wood turtles, other aquatic organisms, and breeding and migrating birds.

Rationale

Two State-listed, threatened freshwater mussels, the tidewater mucket and yellow lampmussel, occur in Sandy Stream. Both mussel species are declining rangewide, and in Maine the populations are fragmented and restricted to discrete areas within three mid-coast drainages. Freshwater mussels are particularly vulnerable and sensitive to habitat changes and environmental contaminants, and have a high risk for extirpation when habitat is degraded. Changes to hydrology, sedimentation, invasive species, water pollution, degradation of riparian areas, and loss of fish hosts are some of the threats to freshwater mussels (MDIFW 2005).

The Sandy Stream Unit borders Sandy Stream for 0.42 miles (see map 3.4). The riparian buffer helps protect water quality and habitat structure for priority species of conservation concern like brook trout and freshwater mussels that use the stream and wood turtles that use the stream and riparian habitat.

Strategies

Continue to:

- Allow natural processes to maintain the existing forested buffer along Sandy Stream at its minimum width of at least 25 feet.

Goal 4. Sunkhaze Meadows Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, wildlife, and cultural resources of the Sunkhaze Meadows Unit.

Objective 4.1 Sunkhaze Meadows Unit: Wildlife Observation and Photography

Provide visitors with existing opportunities for wildlife observation and photography along six walking trails and the snowmobile trail at the Sunkhaze Meadows Unit.

Rationale
Wildlife observation and photography represent two of the six priority public uses to receive enhanced consideration on refuges according to the 1997 Refuge Improvement Act. Providing opportunities for the public to participate in these activities on the refuge promotes visitor appreciation and support for refuge programs as well as habitat conservation efforts in Maine and elsewhere. Opportunities to view and photograph wildlife in a natural setting abound at Sunkhaze Meadows Unit due to its undeveloped landscape. According to information we received during the CCP scoping period, wildlife observation and photography are likely the most common public uses at Sunkhaze Meadows Unit.

An existing network of six trails and a segment of an ITS snowmobile trail (with winter only access for snowmobiles, access for other public uses are allowed in other seasons) provide visitors with access to wildlife observation and photography (see map 3.5). Some of the walking trails have become overgrown with overhanging vegetation, boardwalks have frost-heave, and fallen trees sometime obstruct access. Service staff and volunteers from the Friends of Sunkhaze Meadows NWR conduct trail maintenance currently as time and resources allow, which remains minimal.

Strategies
- Continue to provide minimal maintenance of existing trail system as staff and volunteer resources allow.

Objective 4.2 Sunkhaze Meadows Unit: Hunting

Annually provide visitors access to hunting opportunities at Sunkhaze Meadows Unit.

Rationale
Hunting is one of the six priority public uses to receive enhanced consideration on national wildlife refuges according to the 1997 Refuge Improvement Act. Hunting is also an historic, traditional, and popular activity on the refuge and in the Refuge System. Providing wildlife-dependent recreational opportunities like hunting helps foster an appreciation for wildlife and the habitats that sustain them. At Sunkhaze Meadows Unit, hunting is a public use that draws a number of visitors to the refuge.

To the extent practicable, refuge hunting regulations coincide with State hunting regulations. The Sunkhaze Meadows Unit is currently open according to State hunting seasons except for the coyote and bear seasons. Sunkhaze Meadows Unit is open to coyote and bear hunting, but refuge seasons are shorter than the State seasons. Currently, Maine State regulations for coyote hunting allow daytime hunting all year and night hunting October 1 through August 31. The refuge’s regulations allow daytime and nighttime hunting for coyotes between October 1st and March 31st. The refuge’s bear hunting season starts October 1, and lasts through the end of the State season. The State’s 2013 bear hunting season ends November 1. These shortened seasons are intended to limit potential disturbance to nesting raptors and ground nesting birds in the spring and summer, and migrating birds in the spring and fall (for additional discussion see "Expanding the Refuge and WPA Coyote Season" under "Actions Considered but Eliminated from Further Study"). This shortened season is also intended to minimize potential conflicts with other users during August and September, when there are more visitors to the refuge.

According to State regulations, anyone who hunts with a firearm during any open firearm season on deer is required to wear two articles of solid-colored hunter orange clothing which is in good and serviceable condition and which is visible from all sides. One article must be a hat. The other must cover a major portion of the torso, such as a jacket, vest, coat, or poncho containing at least 50 percent of hunter orange in color. To minimize confusion for hunters, the refuge has recently updated its hunter orange requirements to coincide with State regulations.

Strategies

- Continue to keep the refuge open to hunting according to current Federal, State, and refuge-specific regulations.

Objective 4.3 Sunkhaze Meadows Unit: Fishing

Annually provide anglers with access to fishing opportunities at Sunkhaze Stream and in tributaries at Sunkhaze Meadows Unit.

Rationale

Fishing is one of the six priority public uses to receive enhanced consideration on national wildlife refuges, according to the 1997 Refuge Improvement Act. Fishing is also a historic, traditional, and popular activity in central Maine and in the Refuge System. At Sunkhaze Meadows Unit, fishing is a public use that draws visitors to the refuge. Fishing opportunities are available in 5 miles of Sunkhaze Stream and another 16 miles of tributary streams that include Buzzy, Little Buzzy, Baker, Dudley, and Johnson Brooks, and Birch and Little Birch Streams (see map 3.5). Most of these streams are accessed for trout fishing from road crossings surrounding the perimeter of the unit. Fishing interior portions of Sunkhaze Meadows Unit via boat or canoe is less frequent due to the difficulty of boat or canoe launch access.

Strategies

Continue to:

- Offer fishing opportunities and access on refuge lands.
- Allow boat access to Sunkhaze Stream.

Objective 4.4 Sunkhaze Meadows Unit: Environmental Education and Interpretation

Provide visitors with access opportunities for environmental education and interpretation to promote understanding of nature and the role of the National Wildlife Refuge System.

Rationale

Environmental education and nature interpretation are identified in the National Wildlife Refuge System Improvement Act of 1997 as priority public uses. They serve as valuable tools in the protection of our nation’s wildlife and habitat resources. Educating people about wildlife conservation fosters an appreciation of the important role the refuge plays in support of these efforts and motivates individuals to make responsible environmental choices in the future.

Environmental education in the Refuge System incorporates onsite, offsite, and distance-learning materials, activities, programs, and products that address the audience’s course of study, the

mission of the Refuge System, and the management purposes of the refuge. The goal of environmental education is to promote an awareness of the basic ecological foundations for the interrelationships between human activities and natural systems. Through curriculum-based environmental education, onsite and offsite, refuge staff and partners hope to motivate students and other persons interested in learning the role of management in maintaining healthy ecosystems and conserving our fish and wildlife resources.

Interpretation is an educational activity aimed at revealing relationships, examining systems, and exploring how the natural world and human activities intertwine. It typically includes educational programming that does not fit within a curriculum-based education program. One of its goals is to stimulate additional interest and positive action. Interpretation is both educational and recreational in nature. That is, participants voluntarily become involved in interpretive activities because they enjoy them, and in the process, they learn about the complex issues confronting fish and wildlife resource managers.

Under alternative A, the Service would continue to support environmental education and interpretation to the extent practicable without dedicated staff to support such programming. Environmental education and interpretation at Sunkhaze Meadows Unit is supported largely by providing access and opportunities for partner organizations. The Friends of Sunkhaze Meadows NWR sponsors a number of interpretive events and programs throughout the year. Some of these occur on the refuge, others off-refuge. Local high schools and some University of Maine classes also use portions of Sunkhaze Meadows Unit as an outdoor classroom.

Strategies

Continue to:

- Allow local high school and college instructors and classes to access Sunkhaze Meadows Unit for environmental education purposes upon request.
- Rely on the Friends of Sunkhaze Meadows NWR to promote and conduct approximately one environmental interpretive program each month.
- Allow partners to conduct education and interpretive programs on refuge lands upon request.
- Maintain existing signs and displays as resources allow.

Goal 5. Carlton Pond WPA Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, and wildlife at Carlton Pond WPA.

Objective 5.1 Wildlife Observation and Photography, Hunting, Fishing, Environmental Education, and Interpretation

Allow visitors to participate in wildlife observation and photography, hunting, fishing, and environmental education and interpretation at Carlton Pond WPA.

Rationale
See alternative A, objectives 4.1, 4.2, 4.3, and 4.4, for discussion of the importance of hunting, wildlife observation and photography, and environmental education and interpretation to the Refuge System.

Carlton Pond WPA does not currently have any walking trails or other infrastructure to accommodate visitors to encourage wildlife observation and photography (see map 3.6). However, pedestrian access is authorized for these activities. Access to the waters of Carlton Pond for priority public uses is allowed with motorized and non-motorized boats. Boat launch sites are located off refuge lands.

Carton Pond WPA is open to the same hunting seasons as previously described for the Sunkhaze Meadows Unit, see chapter 2, the Refuge Public Use section and chapter 3, objective 4.2.

Strategies

Continue to:

- Allow local high school and college instructors to access Carlton Pond WPA for environmental education purposes upon request.
- Allow partners to conduct education and interpretive programs on WPA lands upon request.
- Maintain existing signs as resources allow.
- Keep the refuge open to hunting according to Federal, State, and refuge-specific regulations.
- Allow up to two field trial events for hunting dogs each year at Carlton Pond WPA if requested.

Goal 6. Benton and Sandy Stream Units Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the shrublands, woods, grasslands, and wildlife at the Benton and Sandy Stream Units.

Objective 6.1 Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation

Provide visitors with access opportunities at the Benton and Sandy Stream Units for environmental education, interpretation, wildlife observation, photography, hunting, and fishing.

Rationale
See alternative A, objectives 4.1, 4.2, 4.3, and 4.4, for discussion of the importance of hunting, wildlife observation and photography, and environmental education and interpretation to the Refuge System.

Benton and Sandy Stream Units do not currently have any walking trails or other infrastructure; however, these units are open to off trail use (see maps 3.7 and 3.8). Each unit has a small gravel parking area located either onsite (Benton Unit) or off-refuge, adjacent to the unit (Sandy Stream Unit) that allows public parking. Snowmobile trails are maintained by local snowmobiling

organizations through special use permits and are sometimes utilized by neighboring landowners and visitors for walking access for wildlife observation. Access to the waters of Sandy Stream or Fowlers Brook is not provided at either unit.

Hunting is allowed under similar regulations and requirements as noted under alternative A, objective 4.1. However, we do not believe hunting is a frequent use of these areas because of their limited size.

Strategies
Continue to:

- Allow local high school and college instructors to access these units for environmental education purposes upon request.
- Maintain the gravel parking area at Benton Unit as resources allow.
- Keep the refuge open to hunting according to Federal, State, and refuge-specific regulations.

Goal 7. Partnership Coordination. Communicate and collaborate with local communities, Federal and State agencies, local and Tribal representatives, and other organizations throughout Maine and the region to further the purposes of the refuge and the mission of the National Wildlife Refuge System.

Objective 7.1 Refuge Friends Group

Support regular interpretive programming and events sponsored by the Friends of Sunkhaze Meadows NWR at the Sunkhaze Meadows Unit through access, facilities maintenance, and staff involvement.

Rationale
Active Friends organizations are important contributors to refuge management across the Refuge System. The importance of the Friends of Sunkhaze Meadows NWR is all the more crucial given the absence of onsite staff for Sunkhaze Meadows NWR and Carlton Pond WPA. It is primarily through the dedication of these volunteers that environmental education and interpretive programming about the refuge and WPA are available to visitors. These volunteers also act as the eyes and ears of the refuge in the absence of permanent staff. Observant volunteers from the Friends of Sunkhaze Meadows identified purple loosestrife in portions of the Sunkhaze Meadows Unit in 2012. They reported this to refuge staff, and provided assistance in implementing control efforts later that year. Under alternative A, the Service would continue to partner with the Friends to support their efforts to the extent possible given limited staff time and resources.

Strategies
Continue to:

- Work with the Friends of Sunkhaze Meadows to maintain trails and control invasive plant species as resources allow.
- Maintain links to the Friends' Web site from the refuge's Web site.
- Allow Friends group to use refuge buildings to store interpretive materials and other equipment with refuge approval.

- Assist in providing information for and delivery of environmental interpretation programs as resources allow.

Objective 7.2 Agency, Tribal, Academic, and Other Partnerships

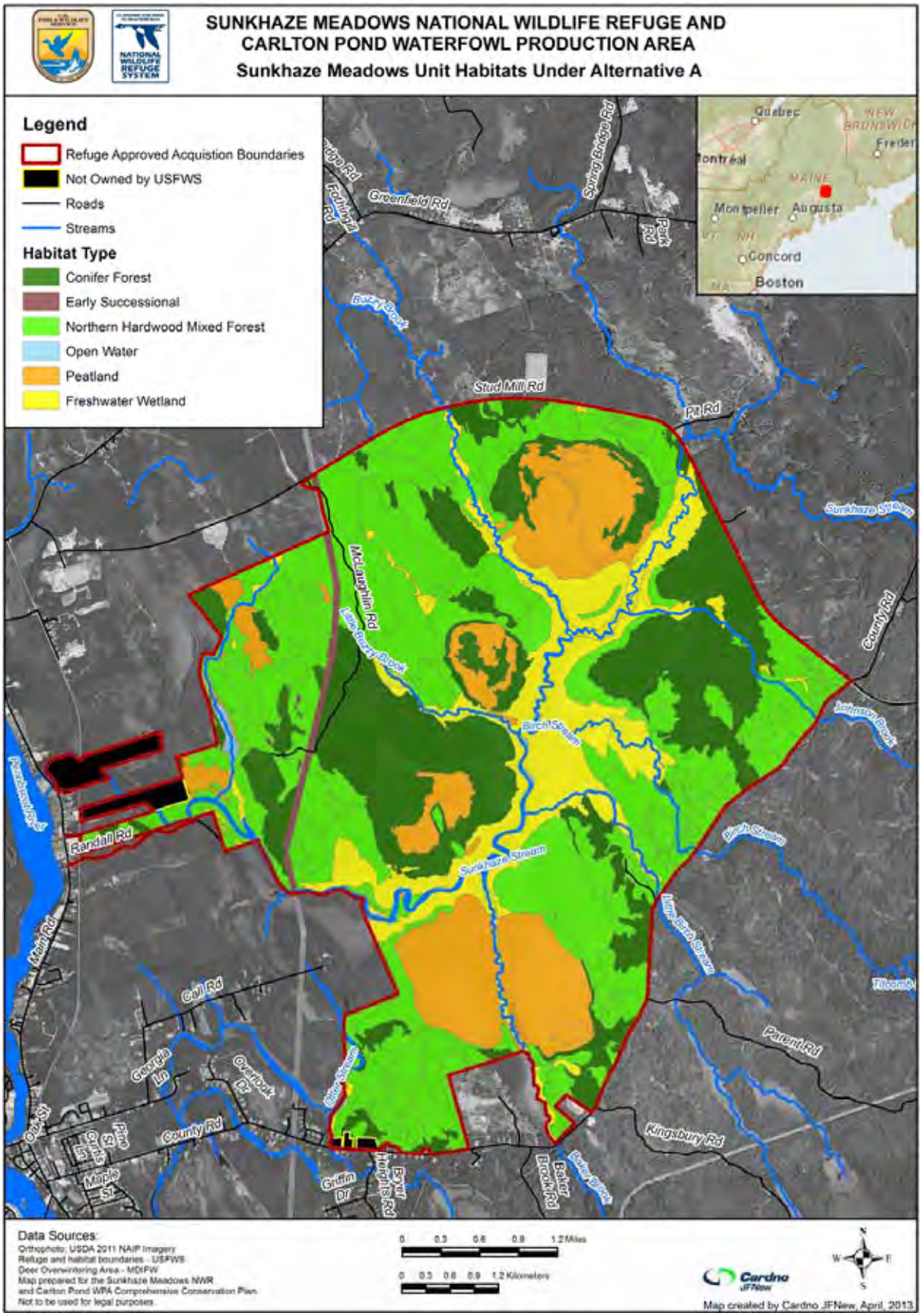
As opportunities arise, work with State agencies, Tribal partners, and universities to support interpretive programs and research projects at Sunkhaze Meadows NWR and Carlton Pond WPA.

Rationale
Similar to objective 7.1, the role of partnerships is important to achieving the management objectives outlined for Sunkhaze Meadows NWR and Carlton Pond WPA. Under alternative A, the Service would continue to partner with other agencies and organizations to the extent possible given limited staff time and resources.

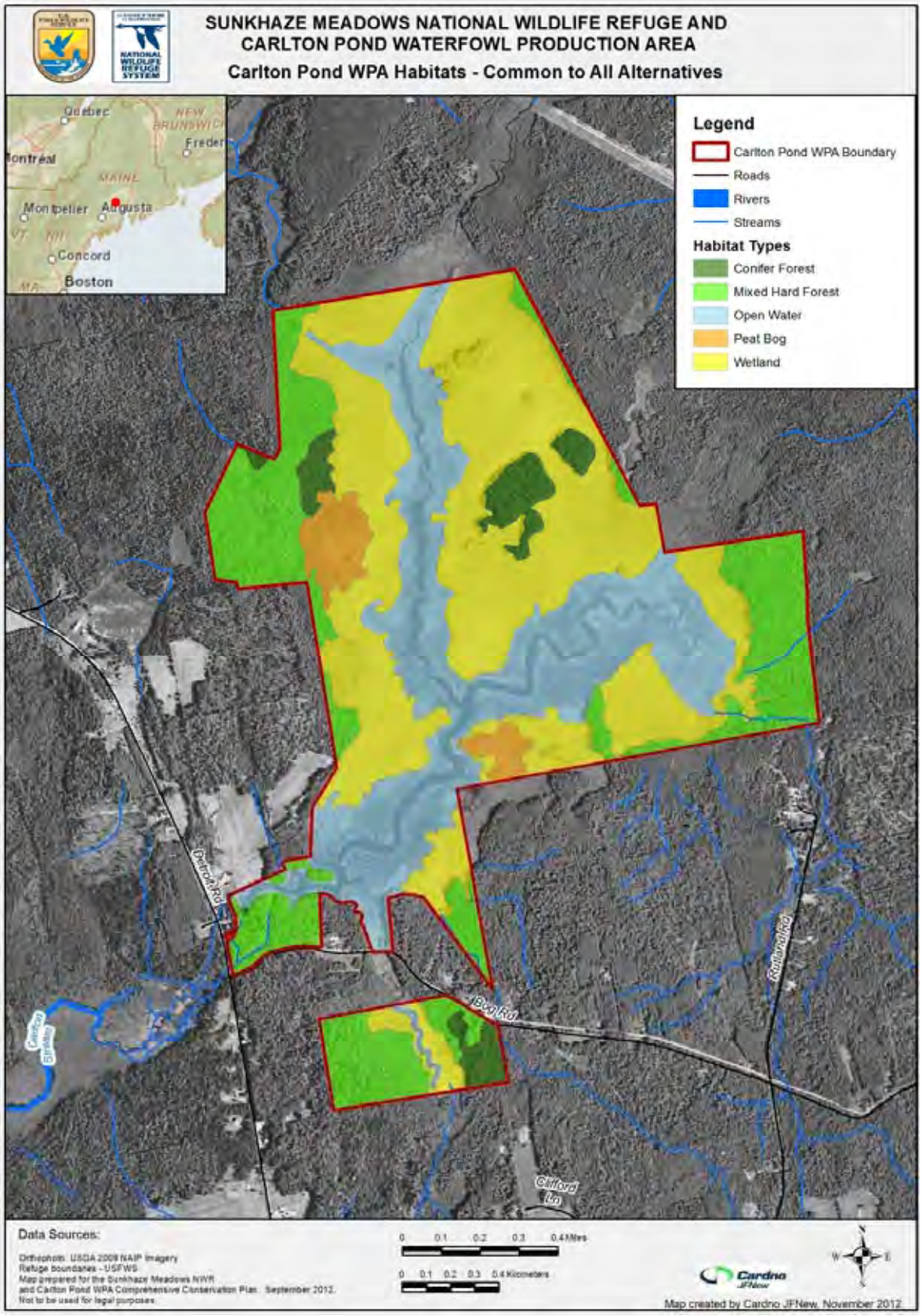
Strategies

- Continue to coordinate and maintain partnership opportunities as they arise.

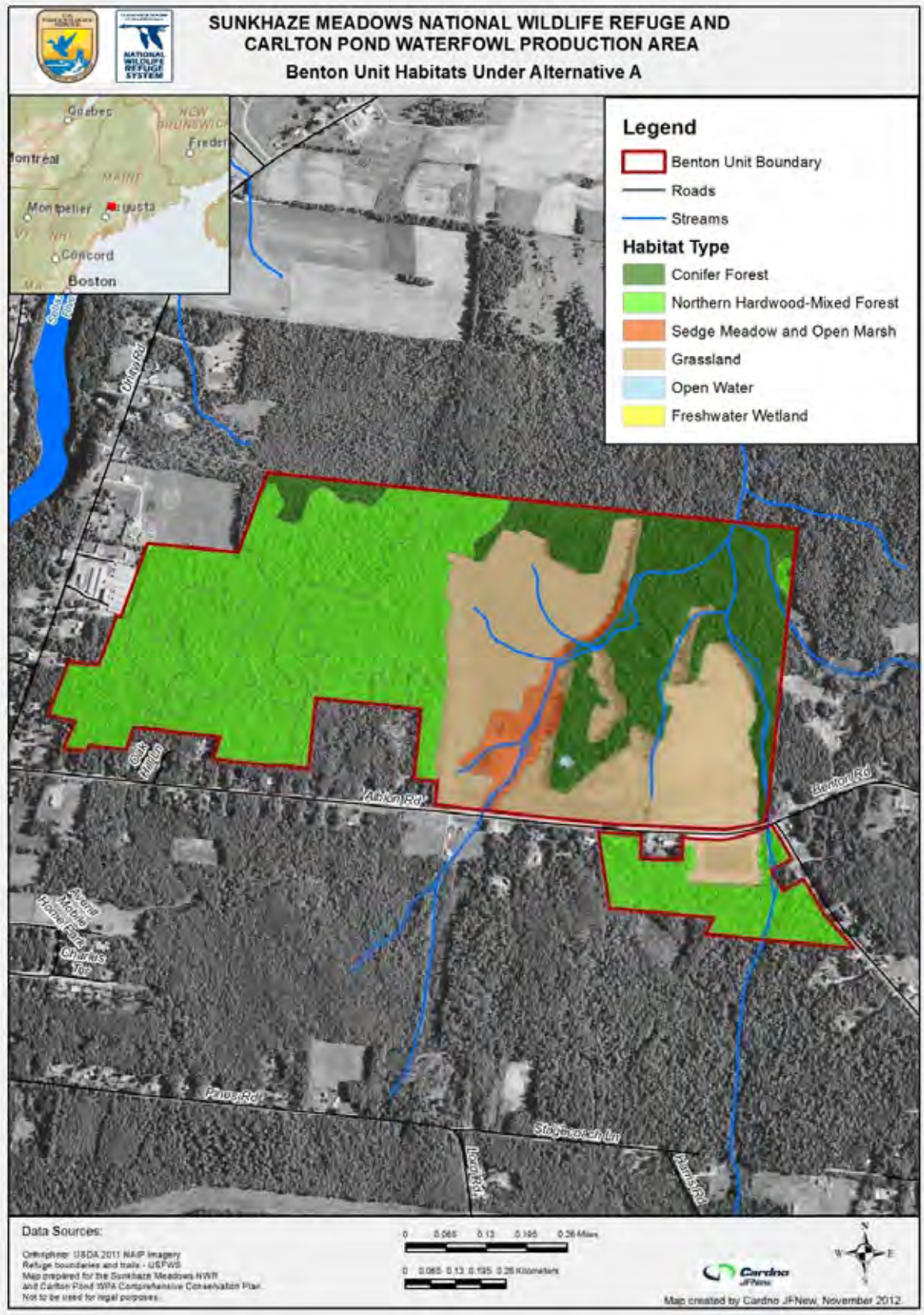
Map 3.1. Sunkhaze Meadows Unit Habitats under Alternative A.



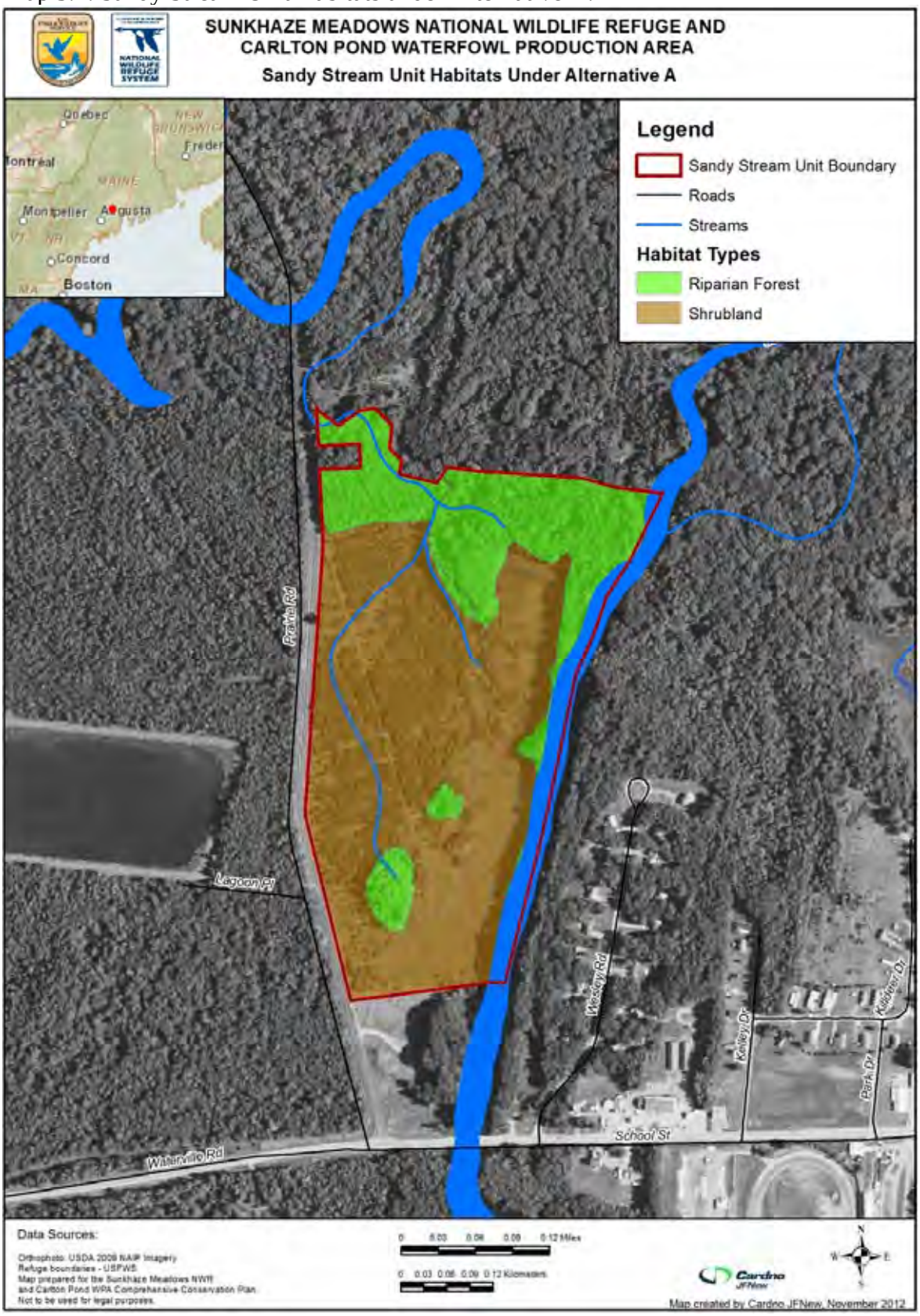
Map 3.2. Carlton Pond WPA Habitats under All Alternatives.



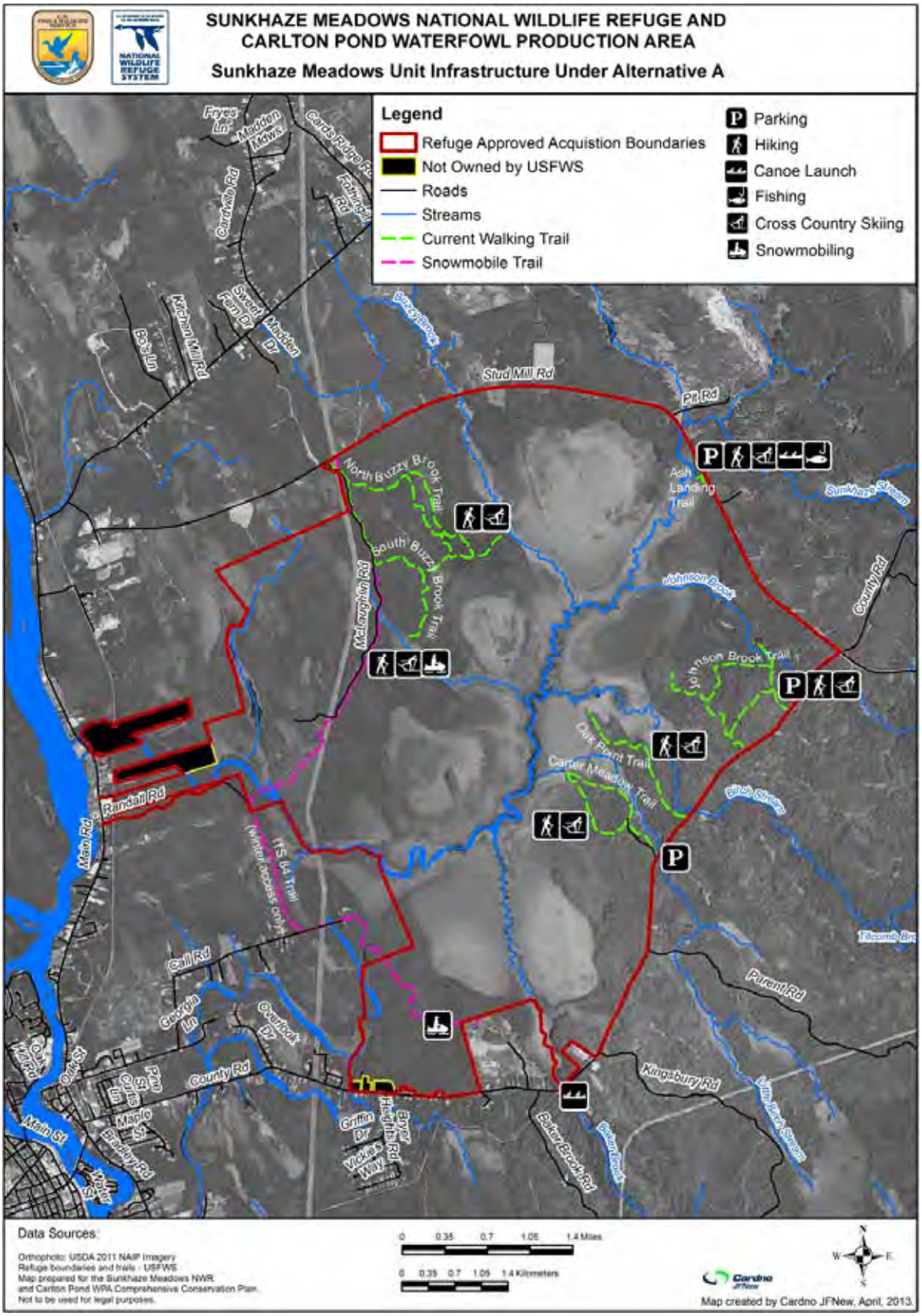
Map 3.3. Benton Unit Habitats under Alternative A.



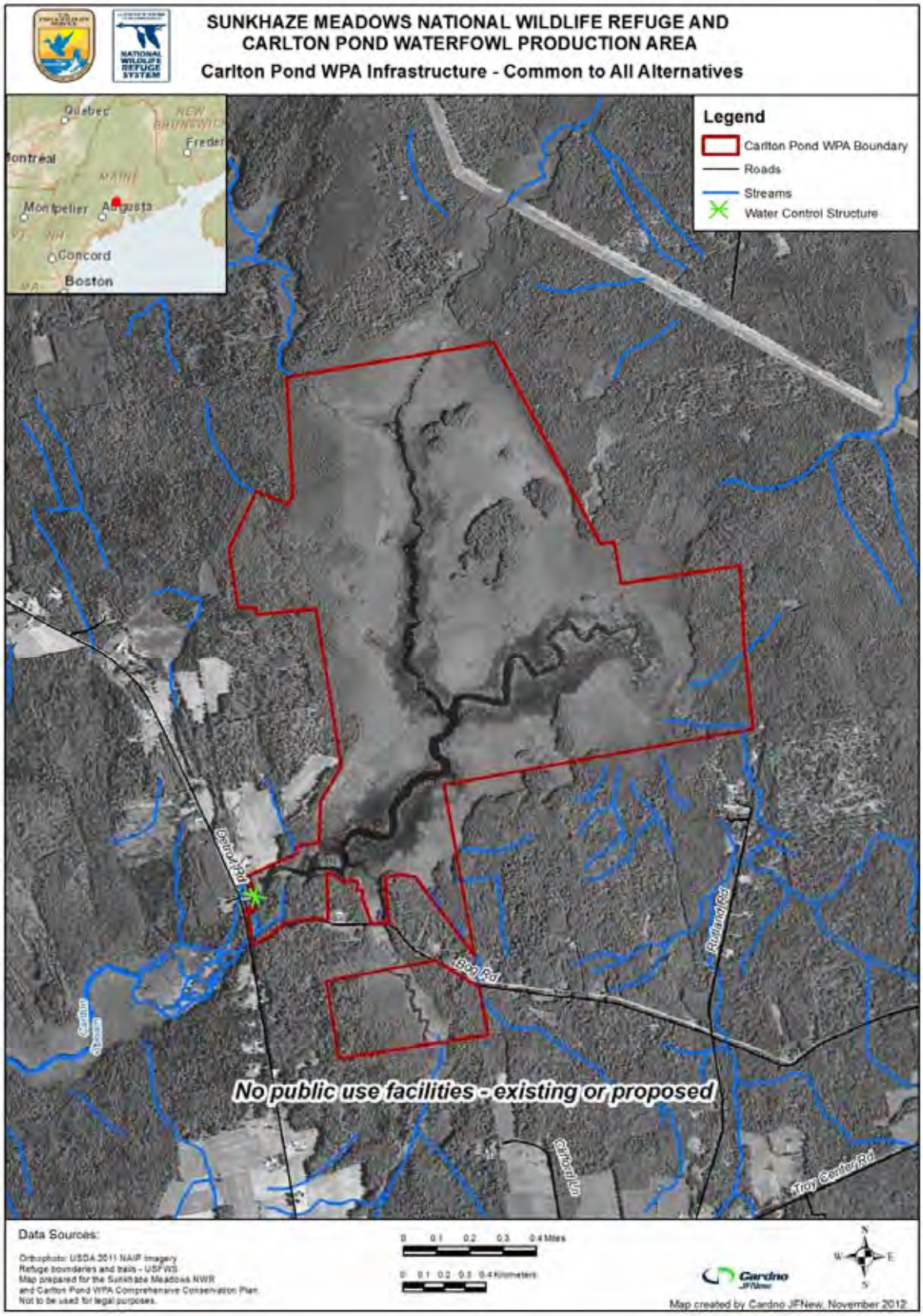
Map 3.4. Sandy Stream Unit Habitats under Alternative A.



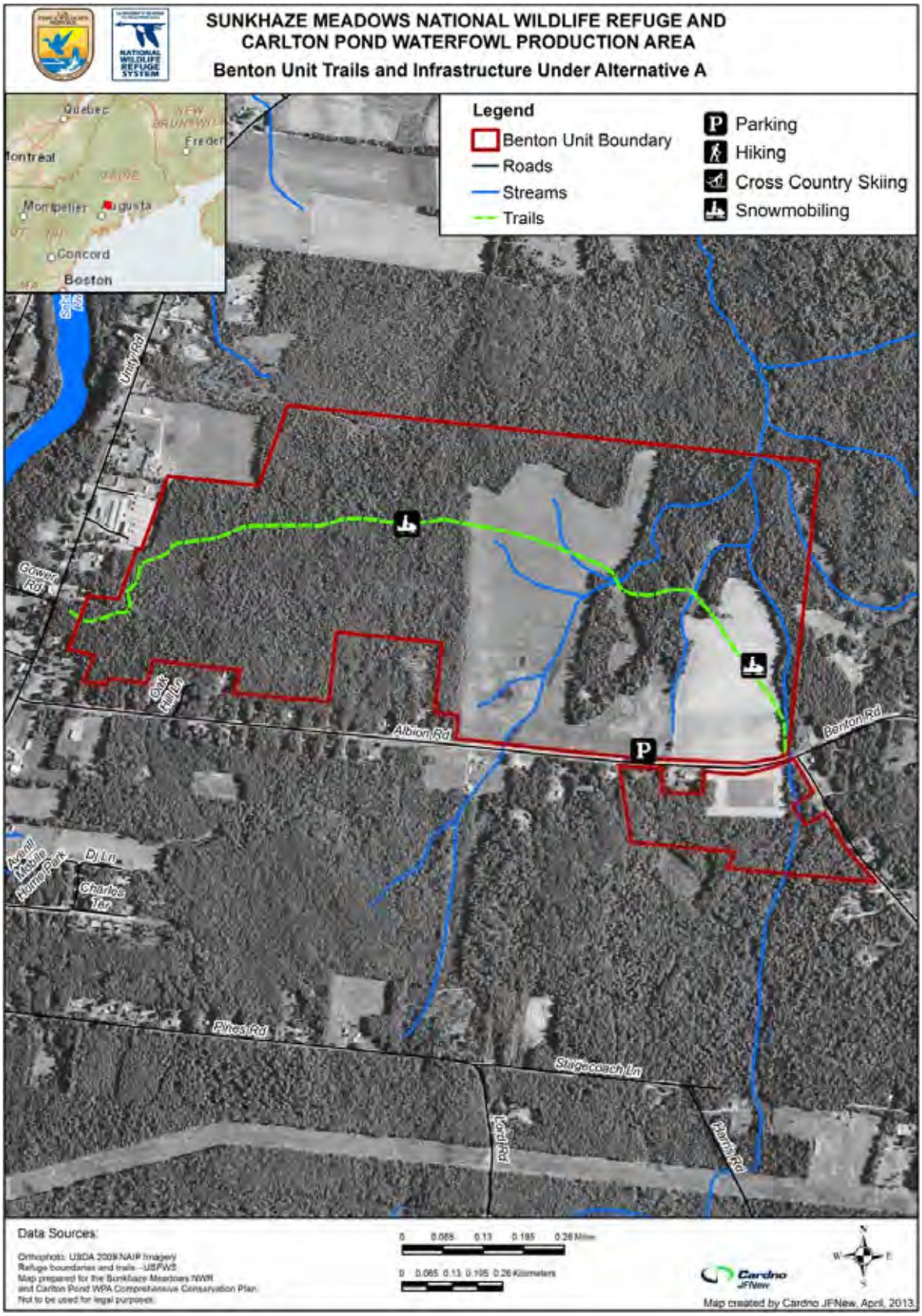
Map 3.5. Sunkhaze Meadows Unit Infrastructure and Streams under Alternative A.



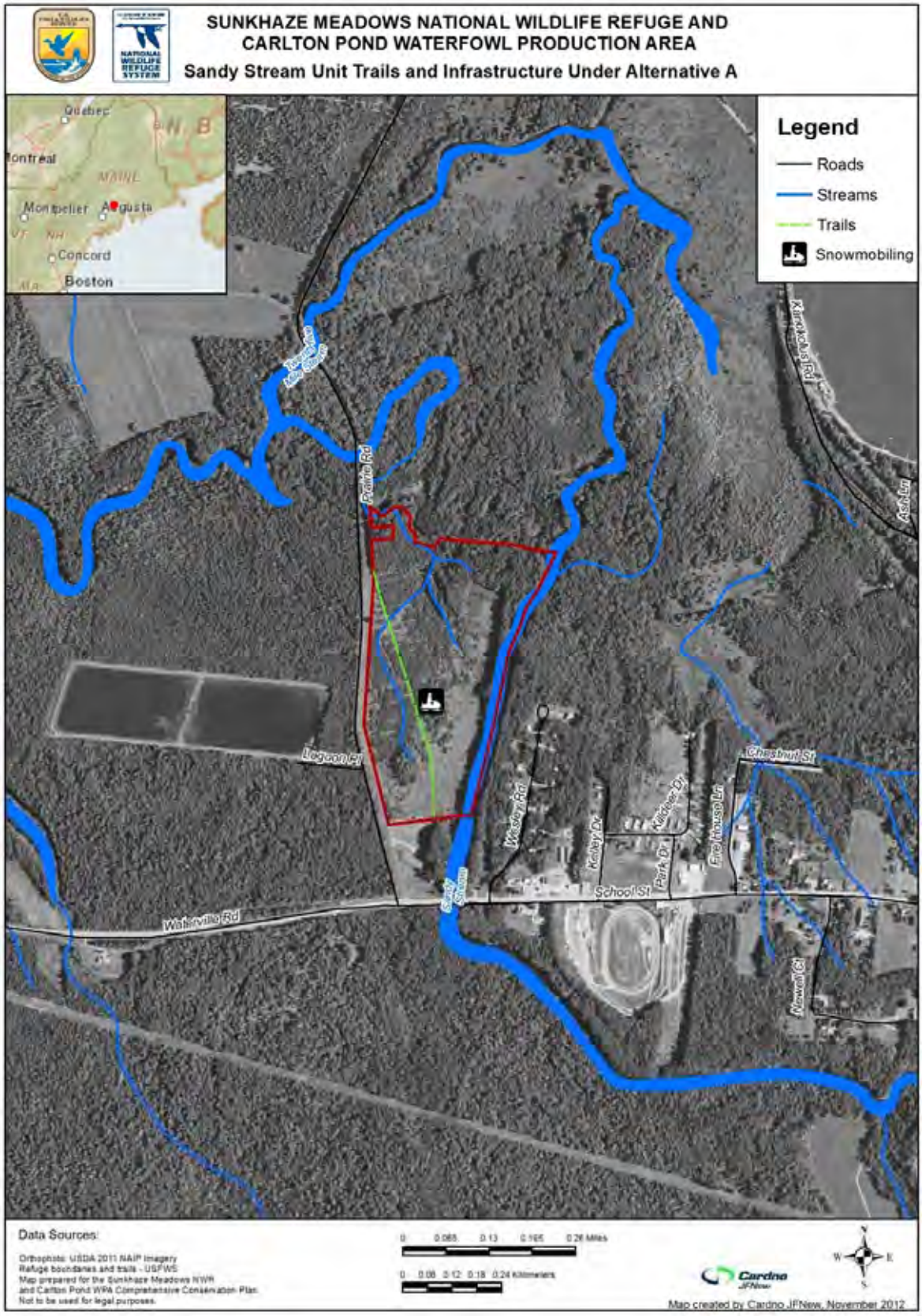
Map 3.6. Carlton Pond WPA Infrastructure under All Alternatives.



Map 3.7. Benton Unit Infrastructure under Alternative A.



Map 3.8. Sandy Stream Unit Infrastructure under Alternative A.



Alternative B. Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)

Alternative B is the Service-preferred alternative. It includes an array of management actions that, in our professional judgment, best achieve the refuge and WPA's purposes, vision, and goals, and would make an important contribution to conserving Federal trust resources of conservation concern in central Maine.

Habitat Management

Under alternative B, we emphasize refuge management focused on preservation of the peat bog complex and surrounding mature forest lands within the Sunkhaze Meadow Unit. We also propose improvements to protect the ecological integrity of other refuge units and their habitats through supporting naturally-occurring successional processes and more targeted management. At the same time, we are promoting more grassland and shrubland habitat management at Benton and Sandy Stream Units. Management of Carlton Pond WPA would largely remain unchanged under alternative B.

Refuge Administration

We used the Refuge System's national staffing model developed in 2008 to guide proposed staffing under alternative B. The Staffing model was developed to answer the question, "What level of staffing is needed to operate and manage a station to achieve the station's purpose, contribute to the mission and goals of the Refuge System, and comply with the Refuge Improvement Act and other laws, regulations, and policy?" The model estimates the total number of full time employees needed at a station to do the work, but management must still decide the best mix of disciplines to do that work and whether to deploy part-time, seasonal, or full-time employees.

In addition to this national staffing model, the Refuge System and the International Association of Chiefs of Police began working together in 2003 on a law enforcement staffing and deployment model. The goal for this effort was to develop a defensible staffing model to quantify law enforcement resource needs for the Refuge System, help refuge managers deploy law enforcement resources, and justify budget requests. The result was a "Deployment Model for the National Wildlife Refuge System" (International Association of Chiefs of Police), completed in May 2005.

Under alternative B, the refuge and WPA would continue to be administered as satellites with ultimate management responsibility residing at Maine Coastal Islands NWR Complex or possibly Moosehorn NWR. We used the national staffing model to help determine the appropriate level of non-law enforcement staffing for alternative B, and the law enforcement deployment model to determine the proposed number of law enforcement staff. Based on our priorities, we are proposing five full-time staff. They would be stationed at or near the Sunkhaze Meadows Unit, but would be responsible for activities occurring at the other refuge units and at Carlton Pond WPA.

The five positions we would propose, based on the staffing models, are:

- One wildlife refuge specialist
- One park ranger (visitor services)
- One wildlife biologist
- One maintenance worker
- One park ranger (law enforcement)

The staff for Sunkhaze Meadows NWR and Carlton Pond WPA would be supported by staff at Maine Coastal Islands NWR Complex. If additional staff is hired in the future, the Service would identify and acquire an appropriate site for refuge management facilities, located on or near Sunkhaze Meadows Unit. Please see appendix E for the proposed staffing charts.

As discussed previously, actual staffing levels are subject to approval of the Service's Northeast Regional Chief of the National Wildlife Refuge System and are based on Federal budget allocations. This document does not represent a commitment of resources. While a few of the strategies proposed could be implemented at current funding and staffing levels, most would depend on additional funding and staff.

Public Use

Under alternative B, we would work closely with partners to increase and enhance the public use experience at all refuge units and Carlton Pond WPA. If staffing is increased as proposed under alternative B, we would enhance public use of Sunkhaze Meadows NWR and Carlton Pond WPA. For example, we would increase Service-led programming and update and maintain public use infrastructure such as signs and trails.

Goals, Objectives, and Strategies under Alternative B

Goal 1. Sunkhaze Meadows Biological Management. Promote the environmental health of Sunkhaze Meadows Unit wetland, forest, and aquatic habitats to protect water quality and sustain native rare plants, natural communities, and wildlife, including species of conservation concern.

Objective 1.1 Sunkhaze Meadows Unit: Freshwater Wetland-Peatland Complex

Conserve the 3,461-acre freshwater wetland-peatland complex on Sunkhaze Meadows Unit that includes open water, marsh, beaver marsh, and shrub swamp to protect and buffer the ecological integrity of the 1,649 acres of peatland, protecting water quality, rare plants, and habitat for American black duck and other breeding waterfowl, bitterns, sedge wren, yellow rail, rusty blackbird, and other wetland-peatland dependent-species. Specifically, we would work to maintain:

- The peatland with the full assemblage of native plants including rare bog bedstraw and showy lady's slipper, and less than 5 percent cover of nonnative, invasive plants such as purple loosestrife.
- Allow beaver activity and minimal human disturbance to support black duck breeding (Diefenbach and Owen 1989).

Rationale

The regional importance and unique characteristics of the Sunkhaze Meadows Unit's freshwater wetland-peatland complex are described previously under objective 1.1 in alternative A.

Thousands of acres of open wetlands provide breeding habitat for wetland-dependent birds on this unit. This large wetland system supports breeding American black duck and other waterfowl. The American black duck is one of the Service's national focal species and is a highest priority species in the Atlantic Northern Forest Bird Conservation Region (BCR 14) (Dettmers 2006) and is of high priority in the North American Waterfowl Management Plan (NAWMP) (USFWS 2004). Black ducks were once the most abundant freshwater duck in North America. However, their populations have dropped steadily since the 1950s, reaching an all-time low in the 1980s. Black duck pairs arrive in Maine by April and the peak hatch is from June 1st through 10th (Longcore et al. 2000). They are quite intolerant of human disturbance even during brood rearing stage so minimizing human disturbance from late May through June may be important (Longcore et al. 2000).

Breeding pairs and calling males of the sedge wren and yellow rail have both been observed (and may breed) in an area of tall emergent vegetation along the Sunkhaze Stream shore (MDIFW 2005). The sedge wren, a State endangered species, reaches its northeastern limit in Maine. The sedge wren breeds in freshwater meadows of sedges and grasses, shallow sedge marshes, and in the moist edges of freshwater wetlands. Objective 3.2 provides more details on the habitat needs of the sedge wren. The yellow rail is a Service bird of national conservation concern (USFWS 2008a). It is a small, secretive wetland bird that breeds in sedge meadows; it hides and runs beneath vegetation. Their numbers have declined across their range, although accurate population assessments are difficult given their elusive nature. Yellow rails build their nest on damp ground among marsh vegetation and feed on insects, snails, and seeds. The yellow rail and sedge wren are considered birds of greatest conservation need in the Maine Comprehensive Wildlife Conservation Strategy (MDIFW 2005).

American and least bitterns have been observed during the breeding season at Sunkhaze Meadows Unit. Both are priority species for the Service (2008) and the State (MDIFW 2005). Both species may be affected by a decline in wetland habitat quality including encroachment by the invasive purple loosestrife (MDIFW 2005). Several other bird species nest in the unit's peatland habitat including olive-sided flycatcher, Lincoln's sparrow, swamp sparrow, and palm warbler. The olive-sided flycatcher, a species of conservation concern (MDIFW 2005, Dettmers 2006, USFWS 2008a) breeds on the refuge. It favors openings in conifer forests and forest edges with tall spruce and high exposed snags from which to forage and sing. Edges of bogs, wooded streams, and burned over areas are also favored habitats (DeGraaf and Yamasaki 2001).

Current threats to the integrity of the Sunkhaze Meadows wetland-peatland complex include potential degradation of water quality from surrounding land uses (e.g., runoff and spills from roads, timber harvesting), expansion of invasive species populations, and changing hydrologic regimes.

Aquatic habitats, including peatlands and coldwater rivers and streams, are likely to be affected by temperature increases, hydrology changes, and invasive species expansion resulting from

climate change over the next 100 years (Whitman et al. 2010). North American peatlands have been sustained for millennia over long wet and dry periods, but their future stability under climate change is uncertain (Environment Canada 2004). Peatlands occur in northern latitudes. Maine's peatlands are found near the southern extent of their range. This may cause them to be more vulnerable to climate change than peatlands farther north because their distribution is determined primarily by climate (Davis and Anderson 2001). Projected increases in summer drought, despite overall increasing precipitation, could impair southern peatlands (Gorham 1991, Burkett and Kusler 2000). Overall, climate change might cause some peatlands to decline and community compositional changes in other peatlands, such as bog plant communities slowly converting into fen plant communities (Almendinger and Leete1998, Siegel and Glaser 2006). Under this alternative, we would begin a monitoring program that would help us to track any potential changes to this habitat associated with climate change.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with at least one full-time employee

- Develop baseline monitoring protocols for climate change monitoring.
- Limit invasive plant infestation to less than 5 percent of the area.
- Work with MDIFW to establish a waterfowl banding program, particularly for American black duck, to contribute to the Atlantic Flyway waterfowl banding goals.

Over the 15-year life of this CCP and three full-time positions

- Develop an index of ecological integrity to measure and track the biological diversity, integrity, and environmental health (BIDEH) of the Sunkhaze Meadows freshwater wetland-peatland complex.
- Evaluate the effectiveness of allowing natural processes to maintain the ecological communities of the peatlands.
- Explore the establishment of a waterfowl banding program to collaborate with other Federal and State partners and to help track movements of priority species such as American black duck.
- Use standard protocols to conduct migratory and breeding bird surveys. Surveys would be designed to detect species presence/absence and long-term population trends. We would focus on priority species including rusty blackbird, olive-sided flycatcher, American black duck, sedge wren, yellow rail, and bitterns.

Objective 1.2 Sunkhaze Stream and Aquatic Habitats

Preserve 17 miles of Sunkhaze Stream and its tributaries that flow through the refuge to protect the water quality and biological integrity by maintaining vegetated streambanks and safeguarding the absence of human-created barriers (physical, chemical, or thermal) along the stream to benefit native species like Atlantic salmon, brook trout, wood turtles, and breeding and migrating birds like American black duck. In particular, maintain waters that have low turbidity levels, suitable dissolved oxygen levels, suitable water temperatures, and are free of environmental contaminants at concentrations injurious to fish and wildlife.

Rationale

The Sunkhaze Meadows Unit encompasses 5 miles of the approximately 20-mile Sunkhaze Stream, which bisects the unit, flowing from the northeast to southwest. The refuge has another 16 miles of tributary streams that include Buzzy, Little Buzzy, Baker, Dudley, and Johnson Brooks, and Birch and Little Birch Streams (see map 3.9).

Optimal brook trout habitat includes clear, cold water; a silt-free rocky substrate in riffle-run areas; an approximate 1:1 pool-riffle ratio with areas of slow, deep water; well vegetated stream banks; abundant stream cover; and relatively stable water flow, temperature regimes, and stream banks. Fifty to 75 percent midday shade is optimal for trout streams and optimal water temperatures are 11 to 17 C (51 to 63 F) and no higher than 24 C (75 F). Brook trout are not highly tolerant of competition from other fish species and thrive in waters not inhabited by other species (Smithwood and McKeon 1999).

Beavers inhabit permanent streams of up to 15 percent gradient, with adequate food resources, that do not have major fluctuations in discharge (Allen 1983). They are active in the Sunkhaze Meadows wetland system. Beaver flowages are attractive to many species of dabbling duck, particularly American black duck and wood duck, as well as other waterfowl, water birds, raptors, songbirds, mammals, amphibians, and reptiles. The effects of beavers on brook trout vary. Beavers may negatively affect brook trout in lowland streams by inhibiting passage (Salyer 1935, Reid 1952), however brook trout may benefit from increased food resources in beaver impoundments (Rupp 1954).

Riparian ecosystems are areas adjacent to water bodies and nonforested wetlands and are often areas with high species richness with dynamic and complex biophysical processes. Riparian areas along rivers provide important structural habitat components including large nest and roost trees for eagles and ospreys and cavity trees for wood ducks, hooded mergansers, and songbirds. Mature riparian forests are important for many species. For example, wood ducks, common goldeneyes, and hooded and common mergansers nest in cavities in live trees with a diameter at breast height (DBH) of 18 inches or more (Bellrose 1976, Peck and James 1983, Robb 1986, Soulliere 1990). Riparian areas often contain a mix of native shrubs including alder, elderberry, and viburnum that provide food and cover for nesting and migrating songbirds. The wood turtle, a species of special concern in Maine, has been observed in the Sunkhaze Stream system. Wood turtles are often considered one of the most terrestrial of Maine's turtles; however, they still depend on the streams and associated riparian areas with sufficient natural cover (Hunter et al. 1999).

Current potential threats to the integrity of Sunkhaze Stream and its tributaries include degradation of water quality from surrounding land uses (e.g., runoff and spills from roads, residential and commercial development), expansion of populations of invasive species, and changing hydrologic regimes as a result of predicted climate change. According to a recent report on climate change and effects on biodiversity in Maine, streams and rivers in the State are projected to undergo a significant hydrological shift from a snowmelt-dominated regime (with high-flow and ice scouring conditions in the spring) to a rain-dominated regime with reduced high-flow conditions in winter (Whitman et al. 2010). Based on modeling results for various climate change scenario's in Hayhoe et al. (2007), if low emissions scenarios prevail, Maine could retain much of its snow season, between 2 and 4 weeks of snow cover per winter month. If

a high emissions scenario results are accurate, by 2050 Maine's snow season could decline by about half.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Evaluate surrounding land uses at least every 2 years for potential impacts on water quality in refuge waterways.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Monitor brook trout populations every 1 to 5 years in Sunkhaze Stream and its tributaries in collaboration with MDIFW, Penobscot Indian Nation Fisheries Biologist, the Service's Fisheries Program, and other partners.
- Annually, work with at least 2 partners or area land owners to protect streams and riparian areas within the Sunkhaze Stream watershed for example, by providing technical support on best management practices for maintaining healthy riparian habitats or by finding ways to conserve and protect land and water.

Objective 1.3 Sunkhaze Meadows Unit: Northern White Cedar Woodland Fen and Cedar–Spruce Seepage Forest

Protect the 390-acre exemplary northern white cedar woodland fen at Sunkhaze Meadows Unit, to ensure a continued canopy dominated by northern white cedar ranging between 4 to 23 inches diameter DBH, with 20 to 60 percent canopy closure, and less than 5 percent invasive plant species cover, to maintain the population of the State-listed, threatened showy lady's slipper, and to provide habitat for species of conservation concern that breed in this habitat type including boreal chickadee and Canada warbler.

Rationale
In a recent survey of the Sunkhaze Meadows Unit, MNAP (2010) mapped an exemplary 390-acre northern white cedar woodland fen (see map 2.5). The cedar woodland fen is a broad, flat peatland dominated by a canopy of northern white cedar, with a dense mix of rough-leaved alder, winterberry, and black ash. Most of the cedar trees are small, although some are up to 23 inches (60 cm) diameter at breast height (DBH). Sphagnum and other mosses dominate the abundant hummocks, but hollows are largely unvegetated and often saturated. The woodland fen is bordered by a narrow swath of cedar-spruce seepage forest, then upland softwood forest on the southeast side, a road on the east side, and by the extensive open wetlands of the Sunkhaze Meadows peatland complex on the remaining sides (MNAP 2010). Beaver dams constructed over the past decade have increased water levels in some portions of the cedar woodland fen. At this time, we are unsure of the long-term impact of this altered hydrology on the northern white cedars. Under this alternative, we would evaluate the current and potential impacts of beaver dams and any other sources of altered hydrology on the cedar woodland fen.

Northern white cedar seepage forests are found primarily in the northern region of Maine. Most known occurrences of this rare (S3) community type in Maine were harvested in the past. Although timber harvest generally doesn't result in permanent conversion of this type, more than

a century may be required for recovery from heavy cutting as northern white cedar is slow to regenerate (MNAP 1998, Gawler and Cutko 2010). This forested wetland at Sunkhaze Meadows Unit contains a very dense stand of small cedar trees with an average diameter of less than 5 inches (MDIFW 2005). Northern white cedar is a long-lived, shade tolerant species; browsing by white-tailed deer and snowshoe hare can limit the regeneration of northern white cedar seedlings. At the nearby Penobscot Experimental Forest researchers observed extensive browsing on cedars by deer, and recommended reducing deer populations to encourage advance regeneration, browsing control to minimize seedling stress, and thinning of white cedar saplings in subsequent entries to promote height growth of the remaining white cedar (Larouche et al. 2010).

The showy lady's slipper, a State-listed, threatened plant species, has been found on this unit. Showy lady's slippers apparently require constant moisture, some sunlight and neutral pH soil conditions. In acid bogs, their roots go under the acid *Sphagnum* moss to more neutral groundwater below. In clearings or woods edges, colonies may be very large and flowering abundant, but plants in deep shade often lack flowers. The seeds seem to germinate best at depths of at least 2 inches. It has been suggested that this may account for the presence of dense colonies in deer yards where the deer hooves may help to push seeds to the appropriate depth. Showy lady's-slipper takes about 15 years to reach flowering age, which explains why they are slow to reappear after colonies have been dug up. The foliage of nonflowering plants emerges in early spring and may be mistaken for false hellebore (*Veratrum viride*). Flowering plants are unique with tall leafy stems bearing one or two large flowers with white petals and sepals contrasting with magenta pink pouch. In Maine, it flowers from late June to July (MNAP 2004).

The showy lady's slipper is a rare plant in Maine due in part to habitat destruction and over picking. Orchids are popular among some specialty gardeners, and populations of this species are vulnerable to unauthorized collection. Plants dug from the wild usually do not survive; more importantly, removing these plants harms the natural population and may cause its eventual disappearance. Tissue-culture propagation of this species has been tried in limited instances, but any plants offered for sale have almost certainly been dug from the wild (MNAP 2004). Harvesting of plants, including orchids, is not permitted on the refuge.

Some bird species that typically nest in spruce-fir or mixed softwood forests, may also nest or forage in the northern white cedar swamp. These include palm warbler, yellow-bellied sapsucker, boreal chickadee, and Canada warbler. The Canada warbler is a high priority conservation species for the Service (USFWS 2008a), the State (MDIFW 2005), and in BCR 14 (Dettmers 2006). It breeds in a range of habitat types including deciduous forested swamps, cedar bogs, and cool, moist, mature forest or streams and swamps with dense undergrowth. Forests with dense understory particularly along streams, swamps, bogs, or other moist areas are important to Canada warblers (DeGraaf and Yamasaki 2003). The white cedar woodland fen at Sunkhaze Meadows Unit does not contain a dense shrub understory, but it still may contain suitable foraging and breeding habitat for Canada warbler. In reviewing habitat requirements, Reitsma et al. (2010) note that they can nest in wet, mossy areas within forest among ferns, mossy hummocks, stumps, and fallen logs. The boreal chickadee, a BCR 14 priority species, depends on forests containing softwood trees with suitable cavities (DeGraaf and Yamasaki 2001).

Climate change could pose long-term concerns for this exemplary community type at the Sunkhaze Meadows Unit. Projected changes in precipitation could negatively alter ground water levels, which play a crucial role in the accumulation and decay of organic matter and governs plant community structure in fens (Seigel and Glaser 2006). Under most climate change scenarios, ground water levels will fall as evapotranspiration increases with temperature, unless it is offset by an increase in summer precipitation (Moore et al. 1997, Myer et al. 1999). Some fens that have deep groundwater systems may be resilient to these changes (Winter 2000). To better understand current conditions and future changes, this alternative includes monitoring refuge habitats using an ecological index that we would develop. This would aid refuge staff in monitoring and adapting management to projected climate change impacts.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Assess regeneration of northern white cedar in the woodland fen and in the seepage forest.
- Study which factors (e.g., browsing by white-tailed deer) are affecting showy lady's slipper and northern white cedar regeneration.
- Develop management prescriptions (e.g. selective harvest, seedling planting, beaver control) if feasible for improving the regeneration of northern white cedar and for sustaining the exemplary community.
- Develop management prescriptions (e.g. invasive species control, deer exclosures, and understory vegetation management) and implement adaptive management if feasible for maintaining or increasing the unit's showy lady's slipper population.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Conduct annual migratory and breeding bird surveys for identified focal species according to standardized protocols to detect presence/absence and long-term trends as staff resources and time allow.
- Work with partners to develop an index of ecological integrity and monitoring protocol for the northern white cedar woodland fen and cedar-spruce seepage forest. After the index and monitoring protocol are developed, monitor for changes to this index every 1 to 3 years.
- Collect baseline data and monitor for habitat changes, particularly changes potentially associated with climate change.

Objective 1.4 Sunkhaze Meadows Unit: Conifer and Northern Hardwood-Mixed Forests

Manage and preserve 2,904 acres of conifer and 5,002 acres of northern hardwood-mixed forests on the Sunkhaze Meadows Unit to promote a self-sustaining, mature forest characteristic of the Atlantic northern forest, to benefit a suite of species of conservation concern in BCR 14 including bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, olive-sided flycatcher, black-throated blue warbler, and wood thrush. Forests should include trees greater than 70 years old, some trees more than 100 years old, canopy dominated by shade tolerant species, trees greater than 16 inches DBH, presence of large logs on forest floor,

presence of trees with long (greater than 6 inches) *Usnea* spp. (lichen), and presence of *Collema* and *Leptogium* lichen species.

Rationale
The importance of late successional and old growth forests is discussed previously in objective 1.4 under alternative A.

The largest suite of priority landbird species in BCR 14 is associated with spruce-fir habitats, especially mature or late successional stages (Dettmers 2006). High priority bird species in BCR 14 that also prefer mature spruce or other conifers include the olive-sided flycatcher (tall spruce), Cape May warbler (mature spruce), and boreal chickadee (conifer forests with decaying trees). Moderate priority species identified as moderate priority in BCR 14 include the northern parula, Blackburnian warbler, and black-throated green warbler (Dettmers 2006), all of which are associated with mature conifer (DeGraaf and Yamasaki 2001). The northern parula is associated with mature moist forests and forested riparian habitats dominated by spruce, hemlock, and fir with an abundance of lichens (especially *Usnea spp.*) that they use in nest building. In some areas where the northern parula has declined, such as southern New England, the decline may be related to the decline of *Usnea spp.*, a lichen that is sensitive to air pollution (DeGraaf and Yamasaki 2001). The bay-breasted warbler, one of the highest priority species, which is at the southern edge of its breeding range on the refuge; this species requires mature conifer habitat. Other priority species, such as wood thrush, favors large mature mixed hardwood forests for breeding (Evans et al. 2011).

Species such as the bay-breasted warbler that have southern range extent near Sunkhaze Meadows NWR may be vulnerable to warmer temperatures and increased pest outbreaks resulting from climate change. As a result, these species could shift their range further north (Whitman et al. 2010). Preserving large expanses of self-sustaining, mature Atlantic northern forest can help these species accommodate these large scale transitions in climate and population range.

The MDIFW (2005) also identified bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, olive-sided flycatcher, black-throated blue warbler, and wood thrush associated with conifer forests or deciduous-mixed forest as high conservation priorities. The State identified several risk factors for these species and associated forest habitats including large-scale logging operations that convert stands to other species and that use short rotations. Habitat loss to development is also a threat (MDIFW 2005).

The presence of downed trees and logs are an important characteristic of late successional and old growth forests that support a variety of migratory birds. Small downed trees and snags that are greater than 12 inches DBH help support species such as black-backed woodpecker. Larger snags and downed trees help support species such as pileated woodpecker and boreal chickadee by providing conditions suitable for cavity nest site excavation and foraging for insects (Flatebo et al. 1999).

The diversity in plant species composition in the northern hardwood-mixed forest explains, in part, the great diversity of bird species of concern that occur in this habitat type. A majority of

high priority species in this habitat, including the black-throated blue warbler and wood thrush, are dependent on a relatively dense forest understory for foraging and nesting. The wood thrush inhabits a wide variety of deciduous and mixed forests throughout Maine. The wood thrush breeds in cool, mature, lowland, mixed or more typically, deciduous forests, particularly mesic to damp woodlands with an abundance of saplings, often near swamps or water (Kendeigh 1948, Dilger 1956, DeGraaf and Rappole 1995). It prefers a shrub sub-canopy layer, shade, and an intermediate soil moisture regime (Morse 1971, Bertin 1977, Roth et al. 1996). The highest density of wood thrush is found in forest patches greater than 200 acres, with a sharp decline in abundance below 100 acres. The black-throated blue warbler occurs in large areas of northern hardwood forests with a dense understory of deciduous or coniferous shrubs or saplings (Darveau et al. 1992).

The rusty blackbird is a priority species of concern for the Service (USFWS 2008a) and the State of Maine (MDIFW 2005), and within BCR 14 (Dettmers 2006). Although the breeding bird survey (BBS) trend for Maine is unreliable for rusty blackbird, there is strong anecdotal evidence of significant, long-term decline (MDIFW 2005). The rusty blackbird nests in riparian areas, boreal wooded wetlands, and beaver flowages in northern New England and Canada (DeGraaf and Yamasaki 2001, Rich et al. 2004). Rusty blackbirds are monogamous and live in very loose colonies during the breeding season. Their bulky nests are made of twigs and are almost always placed near water (Avery 1995), usually less than 10 feet high in thick foliage near the trunk of a young spruce or fir or in a shrub thicket. Some disturbance (e.g., windthrow, fire, beaver activity) helps create forest openings allowing regeneration of softwoods creating nesting habitat (Avery 1995). During migration rusty blackbirds congregate in flocks in wooded swamps (DeGraaf and Yamasaki 2001) and are known to use Sunkhaze Meadows Unit wetlands during spring and fall migration. The rusty blackbird shows some aversion to clearcutting which creates suitable habitat for competitors including red-winged blackbird and common grackle (Dettmers 2006). Other causes for the severe decline of rusty blackbird across its range are attributed to loss of wintering habitat, blackbird control programs, logging, peat extraction, and drought conditions in parts of its range (Rich et al. 2004).

Climate change projections indicate that northern hardwood forests in the Northeast may change significantly in the next 100 years (Prasad et al. 2007). Under high emission scenarios, the extent of oak and pine forests is projected to increase and expand into central and possibly northern Maine (Iverson et al. 2008). Under the lowest emissions scenario, Maine would likely retain its northern hardwood forest. Northern hardwood tree species may have increased growth rates under any emissions scenario due to higher temperatures, a longer growing season, and increases in photosynthesis and water-use efficiency (Whitman et al. 2010). Similar shifts or changes in species are expected for conifer and boreal forests as well. Tang and Beckage (2010) and Prasad et al. (2007) both project a significant decline of boreal conifer forest over the next 100 years. Under this alternative we would initiate monitoring of this habitat type using an ecological index developed by Service staff. This would aid refuge staff in monitoring and adapting management to projected climate change impacts.

This habitat also supports a deer overwintering yard mapped by MDIFW. These areas are utilized by whitetail deer during winters with heavy snow because of their added shelter from wind and snow. In conjunction with our habitat management for priority bird species, we would

work with our State partners to ensure that our habitat management activities do not alter the conditions needed to sustain these habitats.

The threat of nonnative pest species, such as emerald ash borer, was detailed earlier in Actions Common to All Alternatives. Under alternative B, we would utilize the eventual addition of staff to implement a more thorough early detection and rapid response program to identify potential infestations early on and react appropriately to prevent or minimize its impact to the northern hardwood-mixed forest

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Work with the Refuge System regional forester (stationed at Moosehorn NWR) to ground truth and update the forest stand land cover type data derived from aerial photography interpretation.
- Work with the Refuge System regional forester to inventory and delineate forest stand types and dominant species.
- Work with the State to ensure refuge management for priority species in conifer forest areas does not decrease the quality of potential and existing deer yards.
- Meet or exceed State of Maine best management forestry practices if we conduct forest management activities.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Manage remaining 2,904 acres of forest stands using best management practices to promote forest health and provide the best mix of forest age class and structural diversity to benefit nesting and migratory birds, and other native species (e.g. deer) across the landscape. Consider the most appropriate management of age classes given the surrounding land ownership and management and what unique role the refuge can fulfill over time.
- During active forest management maintain nut-producing oak and beech trees, snags, cavity trees, and downed woody material to benefit pileated woodpecker and boreal chickadee, and bears.
- Prior to any active forest management, survey for presence of any vernal pools. Implement seasonal restrictions or buffer zones around any vernal pools identified near proposed work areas to prevent impacts to this sensitive habitat and associated species (e.g., amphibians).
- Identify and monitor potential forest pest species such as emerald ash borer using early detection and rapid response protocols.
- Work with the Service's Northern Forest Land Management Research and Demonstration (LMRD) biologist stationed at Umbagog NWR to coordinate management with recommendations from the LMRD Program.
- Conduct a forest health and condition assessment, as well as stand exams, to determine the current condition of the forest and its species and structural characteristics and to determine if any active forest management is needed to promote mature spruce-fir forest.

- Monitor rare plant populations and the 100-acre exemplary floodplain forest in collaboration with the MNAP to confirm population size and long-term viability.

Objective 1.5 Sunkhaze Meadows Unit: Early Successional Habitats

Over the life of the plan, support at least 107 acres of early successional habitats, primarily shrubland, on the Sunkhaze Meadows Unit to benefit species of conservation concern such as American woodcock and chestnut-sided warbler. Specifically,

- Work with the electric companies to manage their 107-acre transmission line right-of-ways as primarily shrubland with over 30 percent areal coverage of native tree and shrub species, no more than 5 percent bare ground, and at least 95 percent of the area comprised of native species.
- Allow natural processes to maintain or create additional acres of young forest habitat, shrubland, or grassland dominated by trees less than 40 years old and less than 40 feet tall (Whitman and Hagan 2007).

Rationale
A description of early successional habitat and species that benefit from early successional habitat management are discussed previously in alternative A, objective 1.5.

Large-scale, right-of-way clearing for transmission line right-of-way management generally occurs on reoccurring multiple-year intervals, between every 5 to 10 years depending on the vegetation type and growth. This periodic clearing can temporarily remove all woody vegetation within the right-of-way easement within the Sunkhaze Meadows Unit. As discussed under objective 1.3 in alternative A, we understand the need for right-of-way management in light of Federal energy regulations.

Under alternative B, we would work with the electric companies and their vegetation management contractors to selectively remove trees where possible and maintain primarily shrubland within their right-of-ways. In doing so, we would sustain long-term shrub growth and adequate migration and breeding cover for species that prefer shrublands, such as American woodcock and chestnut-sided warbler. Not only would this improved coordination sustain long-term and consistent shrubland cover, it would also prevent the intermittent loss of habitat that occurs during and immediately following large-scale clearing for right-of-way vegetation management.

Additional acres of young forest habitat created by natural processes would also provide suitable habitat for American woodcock and chestnut-sided warbler for the near future. Wind throws or ice storms are examples of natural processes that can occasionally create openings for young forest habitat.

Strategies
In addition to strategies included under alternative A,

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Work more actively with the electric companies to ensure best management practices for vegetation control are used to retain native shrubland community in the transmission line corridor through the Sunkhaze Meadows Unit.
- Over the life of the plan, allow natural processes to maintain or create a mixture of grassland, shrubland, and young forest habitats on the refuge unit.

Goal 2. Carlton Pond WPA Biological Management. Promote the environmental health of forest, open water, and emergent wetland habitat at Carlton Pond WPA to benefit waterfowl and sustain a diversity of wildlife including species of conservation concern.

Objective 2.1 Carlton Pond WPA: Open Water – Emergent Marsh

Manage the combined 783 acres of open water (295 acres), emergent marsh (455 acres), and the 34 acres of treed peat bog on the Carlton Pond WPA to maintain appropriate water levels for the nesting population of State-listed, endangered black terns. Emergent wetlands would be dominated by pickerel weed, cattail, bulrush, and wild rice with less than 5 percent invasive species cover to sustain breeding habitat for American black duck and other breeding waterfowl, and other migratory bird species of conservation concern, including American bittern, least bittern, and marsh wren.

Rationale

Carlton Pond WPA's importance to breeding black tern populations and uniqueness amongst waterfowl production area lands is described in objective 2.1, under alternative A. The Service manages water levels in the WPA by removing or adding boards within a water control structure as needed. Monitoring the integrity of the earthen dam and the spillway are an important part of managing Carlton Pond WPA.

The American black duck is another species of high conservation priority that uses these wetlands not only during migration, but also in conjunction with nesting in the adjacent uplands. For additional information about American black duck, please see alternative B, objective 1.1. In addition to waterfowl, these freshwater wetlands provide migratory habitat for shorebirds and nesting and foraging habitat for other species of conservation concern, such as American bittern, least bittern, pied-billed grebe, and solitary sandpiper (USFWS 2008a). Unfortunately we do not have extensive information on these species and their use of the WPA. In particular, the secretive nature of bitterns and other marsh and wading birds, and the inaccessibility of their preferred habitat, make it difficult to monitor their population levels.

A population of nonnative, invasive purple loosestrife was found at Carlton Pond WPA in 1993. In 1995, the Service initiated a biological control program by releasing *Galerucella pussilla* beetles. Control efforts have continued since then, although not in every year. The beetles are most effective in large infestations of loosestrife. The Carlton Pond loosestrife population may be too small to be effectively controlled by the beetles, although it seems to have contained any spread.

Strategies

In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Initiate aquatic invasive plant prevention through monitoring, Early Detection and Rapid Response, and public outreach.

Over the 15-year life of this CCP and with the hiring of up to three full-time positions

- Work cooperatively with landowners adjacent to the Carlton Pond WPA wetlands on maintaining a sufficient vegetated buffer (for example, leave existing trees, don't mow to the shore line) to prevent runoff of sediments and pollutants into Carlton Pond.
- Explore the establishment of a waterfowl banding program to collaborate with other Federal and State partners and to help track movements of priority species such as American black duck.
- Work with interested neighbors and partners to protect streams and riparian areas within the Carlton Pond WPA watershed, including working with area land trusts or other partners to explore the possibility of acquiring interests in some parcels adjacent to Carlton Pond's inlet if there is interest from willing sellers.

Objective 2.2 Carlton Pond WPA: Conifer and Northern Hardwood-Mixed Forest

Preserve 45 acres of conifer forest and 239 acres of northern hardwood-mixed forest on the Carlton Pond WPA to promote a self-sustaining, mature forest characteristic of the Atlantic northern forest, to provide a buffer for emergent wetlands, and to provide stopover habitat for a suite of migratory bird species of conservation concern in BCR 14, including bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, and olive-sided flycatcher. Specifically:

- Forests should include trees greater than 70 years old, with some trees more than 100 years old.
- Forest canopies should be dominated by shade tolerant tree species, with a median DBH greater than 16 inches.
- Large logs should be present on the forest floor.
- Some trees with long (greater than 6 inches) lichen (*Usnea* spp.), and presence of *Collema* and *Leptogium* lichen species should also be present.

Rationale

The upland mixed forest at Carlton Pond WPA provides important habitat and water quality benefits to Carlton Pond by buffering and filtering potential effects from surrounding land uses that might be detrimental to water quality. The mature forest provides structural habitat components including large nest and roost trees for raptors and cavity trees for wood ducks, hooded mergansers, and songbirds. Migrating songbirds often use forested habitats located adjacent to water bodies such as Carlton Pond. American black ducks nest in the uplands surrounding the emergent wetlands.

Because the upland forest surrounding Carlton Pond WPA is relatively small, it does not require active habitat management, except for the monitoring and control of invasive plant species. In the mid-1970s, the State and the Service initiated a wood duck nest box program that was successful in helping cavity-nesting ducks rebuild their populations. Currently, the Service is moving away from using artificial nest boxes, with a shift toward maintaining habitat that

contains natural nest cavities. See alternative B, objective 1.4, for more detailed discussion of habitat needs of migratory birds using these upland forests.

Carlton Pond WPA is still within a largely unfragmented region with large blocks of undeveloped open space remaining within the watershed. However, residential development, logging, and other uses may impact the integrity of the habitats and water quality on the WPA. The nearby Unity College and the Sebasticook Regional Land Trust are important potential partners in helping the Service work with interested landowners around the Carlton Pond WPA on land stewardship and land conservation.

Strategies

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Conduct invasive species inventory and monitoring to prevent new invasions.
- Remove any duck boxes that are in disrepair and over time remove remaining artificial nest boxes to allow a shift toward natural cavities.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Work with neighbors and partners to protect forested areas within the Carlton Pond watershed, for example, provide technical expertise on best management practices for forest management.
- Work with area land trusts or other partners to explore the possibility of acquiring interests in some parcels adjacent to Carlton Pond's inlet if there is interest from willing sellers.

Goal 3. Benton and Sandy Stream Biological Management. Promote the environmental health of forest, grassland, and shrubland habitat at Benton and Sandy Stream Units to sustain a diversity of wildlife, including species of conservation concern.

Objective 3.1 Benton Unit: Grassland Habitat

Manage at least 92 acres on the Benton Unit as grassland and explore conversion of an additional 22 acres of conifer forest to grassland to provide nesting, migratory, and wintering habitat for birds of conservation concern such as bobolink, sedge wren, and American woodcock, by maintaining a diverse mix of species comprising at least 90 percent native grass and forb cover, less than 10 percent shrub cover.

Rationale

The regional decline of grasslands, associated species, and the Benton Unit's context within that landscape is described in objective 3.1 under alternative A.

Grasslands usually require active management (e.g., mowing, prescribed burning) to prevent natural succession to shrubland and forest. Most of the grassland bird species (e.g., grasshopper, vesper, and savannah sparrows, and eastern meadowlark) that have declined in the region require 20 acres or more of contiguous grassland habitat (Jones and Vickery 1997). Small grasslands surrounded by forest or shrubland and isolated from each other are unlikely to provide quality

nesting and feeding habitat for these birds; however, small forest openings provide singing grounds for woodcock and foraging areas for a variety of wildlife, including foraging habitat for post-fledging and migrating mature forest birds. Larger units (greater than 20 acres) of grassland are rare within the landscape surrounding the Benton Unit. Mixed grasses of variable species and height provide nesting and feeding habitat for bobolink, savannah sparrow, and other resident and migratory birds (Wiens 1969, Bollinger and Gavin 1992). Currently the Service relies on a local farmer, through a special use permit, to mow the grassland after July 15th. This is a cost-effective and efficient method for maintaining this habitat on a property that is a long distance from the refuge headquarters (see map 3.10).

Under this alternative, we would also evaluate and potentially expand the grassland area at the Benton Unit by 22 acres. This would entail converting 22 acres of forest to grassland. Currently, this forested area almost divides the unit's grasslands into two sections (see map 3.10). Our intent is to create one grassland area on the refuge over 100 acres. This larger grassland would provide more habitat for grassland species, higher quality habitat (by providing a larger area and less edge), and would support a wider variety of grassland species because of its larger size. Before converting this area to grassland we need to evaluate the soils and topography of this area, as well as the logistics and costs of conversion and long-term maintenance, as these may not be conducive to establishing or maintaining it as grassland.

In addition, the Benton Unit grasslands provide an opportunity for environmental interpretation of the importance of grassland habitat and a demonstration area for other landowners, including farmers, on how to modify mowing regimes to benefit wildlife.

Strategies

Over the 15-year life of this CCP:

- Within 5 years, work with Unity College to study presence and abundance of bird species using the Benton Unit grasslands. Use this information to inform decisions about habitat management at the Benton Unit.
- Annually mow 72 acres of the existing grasslands after July 15th through a special use permit to maintain the habitat and protect ground nesting birds. Reevaluate mowing timing restrictions and change as needed when warranted for species protection.
- Allow the 3 acres of grassland in the northern property boundary to succeed to mature forest.
- Use prescribed burning to maintain 20 acres of existing grassland, which is too rocky to mow.
- Conduct invasive species inventory and monitoring to prevent new invasions as resources allow.

With the hiring of at least three full-time positions, we would:

- Evaluate soils and topography and convert if feasible 22 acres of conifer forest within the central portion of the unit to grassland to create a larger and more contiguous grassland habitat.

- If we determine these acres are conducive to grassland habitat and resources are available, we would convert them. Because of the topography, we would likely maintain these acres as grassland through prescribed burning.

Objective 3.2 Benton Unit: Sedge Meadow and Open Marsh

Maintain 13 acres of sedge meadow dominated by sedges and grasses averaging 3.5 feet tall, including 2.4 acres of emergent marsh-open water dominated by cattail and a mix of sedge species at the Benton Unit to sustain the quality and natural function of the freshwater wetlands as breeding and migratory habitat for species of conservation concern such as sedge wren, rails, and other wetland-dependent wildlife, and as potential foraging areas for bitterns.

Rationale

The sedge wren, a State-listed, endangered species, reaches its northeastern limit in Maine. Sedge wrens breed in wetlands dominated by sedges or grasses including wet hayfields, sphagnum moss bogs, and pond edges, and avoid wetlands dominated by cattails or with sparse vegetative cover. The species is considered nomadic, so absence from an area does not necessarily indicate poor habitat (NHFG 2005). Additional details regarding sedge wren habitat preferences and use of Benton Unit are described in alternative A, objective 3.2.

Shallow, freshwater wetlands with an abundance of tall emergent vegetation interspersed with open water are important for bitterns and rails. The 1.9 acres of restored wetlands at the Benton Unit offer foraging habitat for these wading birds and are breeding habitat for other common wetland birds including tree swallows and red-winged blackbirds (see map 3.10). The cattails, while unsuitable for sedge wrens, are ideal for bitterns. Both American bittern and least bittern are species of concern in BCR 14, in the State, and for the Service. The small, emergent marsh wetlands at Benton are more likely to function as alternative foraging sites for bitterns; typically these secretive marsh birds breed in larger wetlands (greater than 10 acres) (NHFG 2005).

This habitat also may benefit other species such as amphibians and reptiles. Unfortunately, at this time, we do not have inventory records of these and other species groups. Under this alternative, we would pursue such inventories through partnerships with agencies, organizations, or academic institutions.

Strategies

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Evaluate, and modify if needed, the mowing regime around the sedge meadow and freshwater wetlands to enhance wetland conditions for sedge wren, bitterns, and other wetland-dependent bird species.
- Explore partnership opportunities to inventory use of habitat by reptiles, amphibians, and priority birds of conservation concern, including sedge wren.
- Continue to allow natural process to maintain the sedge meadow habitat.

Objective 3.3 Benton Unit: Northern Hardwoods-Mixed Forest and Conifer Forest

Manage 155 acres of northern hardwood-mixed forest and 52 acres of conifer forest on the Benton Unit to promote a self-sustaining, mature forest characteristic of the Atlantic northern

forest, to benefit a suite of species of conservation concern in BCR 14 including northern parula, blackburnian warbler, black-throated blue warbler, and wood thrush. Specifically:

- Forests should include trees greater than 70 years old, with some trees more than 100 years old.
- Forest canopies should be dominated by shade tolerant species with an average DBH greater than 16 inches.
- Large logs should be present on the forest floor.

Rationale
Same as alternative B, objective 1.4

The northern hardwood-mixed forest and conifer forest at Benton Unit comprise a little over half of this refuge unit. While in itself, this unit contains a small amount of forest, it is bordered to the north by a large expanse of nearly 400 acres of contiguous northern mixed hardwood and conifer forests. Similar to the Sunkhaze Meadows Unit, this larger expanse of forests supports overwintering habitat for white-tailed deer (i.e., a deer yard). A portion of this mapped deer yard extends into the northern portions of the Benton Unit. The importance of deer yards to State wildlife management goals was noted previously under alternative A, objective 4.2.

Strategies

- Over the 15-year life of this CCP, allow 3 acres of grassland in the northern property boundary to naturally convert to forest.

With the hiring of at least three full-time positions

- Conduct a forest health and condition assessment, as well as stand exams, to determine the current condition of the forest, its species, and its structural characteristics. Use this information to determine if any active forest management is needed to promote mature mixed conifer-hardwood forest.
- Explore partnership opportunities (e.g., with Unity College) to inventory use of forest habitat by reptiles, amphibians, and priority birds of conservation concern.

Objective 3.4 Sandy Stream Unit: Shrubland Habitat

Manage 37 acres of shrubland habitat dominated by alder species with some gray dogwood and red maple on the Sandy Stream Unit to provide nesting and migratory habitat for birds of conservation concern such as American woodcock.

Rationale
The regional landscape and trends in shrubland habitat, along with Sandy Stream Unit's context within that scale are described in objective 3.4, under alternative A.

Under this alternative, we would maintain most of the existing shrubland habitat. We would also work with the local snowmobiling club that maintains the snowmobile trail on Sandy Stream Unit to relocate the trail closer to Prairie Road to reduce fragmentation of the shrub habitat.(see map 3.11).

Strategies

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Work with the snowmobile club to relocate the snowmobile trail so it is adjacent to Prairie Road to provide a more contiguous habitat unit.
- Work with the snowmobile club to coordinate snowmobile trail maintenance with refuge's shrubland management to minimize disturbance.

Over the 15-year life of this CCP

- Use vegetative treatments such as by prescribed burning or mowing every 10 years, or as needed, to maintain 37 acres of shrubland habitat and to help control invasive plants.

Objective 3.5 Sandy Stream Unit: Forested Riparian Habitat

Expand the existing forested riparian buffer to at least 90 feet along Sandy Stream to protect the water quality and biological integrity that sustains native brook trout, rare freshwater mussels, wood turtle, other aquatic organisms, and breeding and migrating birds.

Rationale

While we do not own any interests in Sandy Stream itself, the Service, through its management of the Sandy Stream Unit, helps maintain water quality important to downstream aquatic organisms including the rare mussels. The rare mussel species that occur in Sandy Stream are described in alternative A, objective 3.5. The Benton and Sandy Stream Units are both within the Unity Wetlands focus area identified in the Maine Comprehensive Wildlife Conservation Strategy (MDIFW 2005); the primary conservation strategy identified for this focus area was to maintain or improve water quality.

The size and quality of the riparian buffer is critical to protecting the water quality of the adjacent waterways and for providing wildlife habitat. The existing riparian buffer of 25 feet along some stretches of the Sandy Stream Unit is not optimal for protecting water quality and providing riparian habitat for nesting and foraging birds. Forested buffers of at least 90 feet proposed for Sandy Stream (see map 3.11) would help protect water quality which is critical to invertebrates and freshwater mussels (Kiffney et al. 2003). It would also improve shade for the river which would benefit brook trout, wood turtles, and other aquatic species. Over time, the expanded riparian forest would offer additional natural cavities for nesting ducks (such as wood ducks and mergansers), roosting bats, and resting places for other wildlife (Hawes and Smith. 2005, Bryan 2007).

Strategies

- Over the 15-year life of this CCP, expand the riparian forest along Sandy Stream to at least 90 feet by ceasing brush cutting and allowing natural succession to develop a mature riparian forest.

Goal 4. Sunkhaze Meadows Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, wildlife, and cultural resources of the Sunkhaze Meadows Unit.

Objective 4.1 Wildlife Observation and Photography – Sunkhaze Meadows Unit

Provide visitors with opportunities for wildlife observation and photography along four existing walking trails, a new trail, the ITS snowmobile trail (in winter), and the existing boat access site at the Sunkhaze Meadows Unit to connect visitors with nature and inspire stewardship in their everyday lives.

Rationale
As under alternative A, visitors would continue to have opportunities to access the Sunkhaze Meadows Unit for wildlife observation and photography. Providing high quality opportunities for wildlife observation and photography on the refuge promotes visitor appreciation and support for the refuge and the Refuge System, while also benefitting the local economy.

Under this alternative, opportunities for wildlife observation and photography would be enhanced, as outlined in the strategies below. This alternative would continue to allow access along 6 miles of existing trails (Johnson Brook, Carter Meadow, Ash Landing, and Oak Point) and along the 3.2 mile long McLaughlin Road. We would improve access by creating a new connector trail along Carter Meadow Road (see map 3.12).

The North and South Buzzy Brook Trails combined contain nearly 4.4 miles of trail requiring maintenance. Under this alternative, we would close the North and South Buzzy Brook Trails because they appear to be less used and are already largely inaccessible because of fallen trees and overhanging vegetation. This would allow refuge staff to focus resources on maintaining the remaining four trails as well as developing additional facilities and programs. Access on the north and western portions of the refuge would still be provided via McLaughlin Road.

This alternative also proposes some new facilities to improve visitor experience and safety (see map 3.12). Under alternative B, a new trail would be created, eliminating the need for visitors to walk down Carter Meadow Road to access Carter Meadow Trail. This new trail would improve the visitor experience by being relocated off of the current gravel road. Two new gravel parking lots would be developed under this alternative as well. The first would be located near the entrance of Carter Meadow Road off of County Road. The other would be located off of County Road as well, near the Oak Point trailhead. These added parking areas would improve access opportunities to these areas by creating local parking availability. They also would help improve visitor safety. Currently, visitors must park in the existing parking lot north of the Oak Point Trail and walk along County Road to access either of these areas. By creating new parking areas, we would prevent visitors from needing to walk along the road to access these trails.

Boating is probably the best way to observe the refuge's wildlife and habitats at certain times of year. Currently, boat access to Sunkhaze Stream and its tributaries on the refuge is limited. Under this alternative, we would partner with others to create additional access points to the

stream and, if feasible, one or more tributaries under this alternative. Due to extensive wetlands and other important habitats, refuge lands do not offer good opportunities to develop boat access, so we plan to work with willing landowners to establish boat access on lands and waters near or adjacent to the refuge. We would like to explore opportunities to develop boat access points along Sunkhaze Stream near its mouth as well as upstream near the current Ash Landing access point. In addition, navigating Sunkhaze Stream itself can be disorienting, particularly in spring when the stream is flooded. The lack of easily distinguishable landmarks can make it easy for those unfamiliar with the stream and its tributaries to become lost. Commercially guided tours of the refuge could expand opportunities for visitors to explore the refuge safely.

We would also work to better orient, inform, and guide the visiting public, and help create a more fulfilling wildlife observation and photography experience through a variety of means, including additional updating of the refuge's Web site, refuge brochure, and interpretive panels.

Strategies

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Improve the refuge's Web site to encourage visitation by adding trail maps, bird lists, and recent observations.
- Close North and South Buzzy Brook Trails due to maintenance difficulty.
- Explore feasibility of adding a trail from the Carter Meadow parking lot that would allow access to Spruce Loop and Oak Point Trails without walking on County Road.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Improve directional trail signs to better access and identify trailheads.
- Develop a new trail from the entrance of Carter Meadow Road to the existing Carter Meadow trailhead.
- Develop two gravel parking areas: one at the entrance of Carter Meadow Road and the other near the Oak Point trailhead.
- Replace boardwalks and eliminate a spur trail along Johnson Brook Trail.
- Expand wildlife observation opportunities by exploring the potential for commercial guided canoe and kayak trips along Sunkhaze Stream.
- Work with willing landowners to establish boat access on lands and waters near or adjacent to the refuge, including exploring opportunities to develop boat access points along Sunkhaze Stream near its mouth as well as upstream, and if feasible, on tributaries.

Objective 4.2 Hunting

Annually, allow access for hunting of big game, upland game, and migratory game birds in accordance with State and refuge regulations and consistent with sound biological principles to create opportunities for connecting visitors with nature by providing participants with reasonable harvest opportunities, uncrowded conditions, and minimal conflicts with other users.

Rationale

The importance of hunting to Maine and the Refuge System is described in alternative A, objective 4.2.

In addition, under alternative B we propose improvements to the refuge Web site to better inform hunters regarding refuge-specific regulations.

Strategies
In addition to strategies outlined in alternative A:

- Within 1 year of CCP approval, update and maintain the refuge's Web site with current, refuge-specific, hunting regulations.

Objective 4.3 Fishing

Annually provide anglers with access to fishing opportunities at Sunkhaze Stream and its tributaries at the Sunkhaze Meadows Unit to create opportunities for connecting visitors with nature.

Rationale
The importance of fishing to Maine and the Refuge System are described in objective 4.3 under alternative A.

Under alternative B, we would continue to offer the same access opportunities as outlined in objective 4.3, under alternative A. Under this alternative, we would update the refuge Web site with current fishing regulations and information to better inform anglers of fishing opportunities at the refuge. As described previously, we would work to improve boating access to the refuge, which would enhance fishing opportunities since anglers frequently fish from boats on refuge waters. As discussed under objective 4.1, we would work with willing landowners to develop additional boat access areas.

Also discussed under objective 4.1, navigating Sunkhaze Stream itself can be disorienting, particularly in spring when the stream is flooded. The potential for commercially guided services of Sunkhaze Stream and its tributaries could expand opportunities for visitors to explore the refuge safely.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP and with the hiring of at least one full-time position

- Improve signs, brochures, and the Web site related to fishing opportunities on the refuge.

Over the 15-year life of the CCP and with the hiring of at least three full-time position

- Expand fishing opportunities by exploring commercial guided services along Sunkhaze Stream.
- Work with willing landowners to establish boat access on lands and waters near or adjacent to the refuge, including exploring opportunities to develop boat access points along Sunkhaze Stream near its mouth as well as upstream, and if feasible, on tributaries.

Objective 4.4 Environmental Education and Interpretation

Over the life of the plan, we would improve environmental education and interpretation at the refuge by developing and implementing Service-led environmental education programs,

providing additional support to existing, volunteer-led programs (i.e., Friends of Sunkhaze Meadows), and working with new partners to promote understanding of the refuge and the role of the National Wildlife Refuge System.

Rationale
The importance of environmental education and interpretation to the Refuge System is described in objective 4.4 under alternative A.

Under alternative B, we would expand upon our current, volunteer-led, environmental education and interpretation programs, outlined in objective 4.4 under alternative A. Local schools are incorporating wildlife and wetland topics into their curriculums to meet science-based standards of learning and help students understand scientific concepts, principles and theories pertaining to their physical setting and living environment. The refuge can provide educational materials as well as an outdoor laboratory to augment the teachers' existing curriculum and tie into learning standards. Under this alternative, with the addition of staff, we propose developing relationships with local schools to provide and promote the use of Sunkhaze Meadows Unit for environmental education programming. Over the 15-year life of the CCP, we would develop and conduct a series of Service-led environmental education and interpretation programs as well as continuing to support the ongoing efforts of the Friends of Sunkhaze Meadows.

We would work closely with partners such as the town of Milford, the Penobscot Indian Nation, and others to develop regional cultural and eco-tourism opportunities to increase refuge visitation. In doing so, we would support these partners in achieving their cultural resource and economic development goals, while encouraging visitation to the Sunkhaze Meadows Unit and increasing appreciation of and support for the refuge and the Refuge System.

With the addition of staff and potential increase in visitation, we would update existing interpretive displays, signs, and materials.

Over the 15 year life of the CCP, we would work with the Penobscot Indian Nation to develop interpretive materials to better inform refuge visitors about the significance of the lands and waters comprising Sunkhaze Meadows Unit to Penobscot Indian Nation history and culture. Through these partnership,s we intend to improve the public's understanding of the role of the Refuge System.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Update the existing signs on the unit, develop at least one additional interpretive display, and update existing general brochure.
- Develop relationships with at least two local schools to provide at least one environmental education program or teacher training each year.
- Work with the town of Milford, the Penobscot Indian Nation, and other partners to develop at least one program (e.g., presentation) and one outreach material (e.g.,

brochure) to encourage regional, cultural, and ecological tourism, and increase refuge visitation.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Work with the Penobscot Indian Nation, town of Milford, Friends, and others to develop interpretive materials (brochures, signs, Web site) to educate the public about the refuge's cultural resources.
- Conduct an average of four or more interpretive programs each month across all refuge units and Carlton Pond WPA, led by Service staff.
- Explore opportunities to create a collaborative visitor contact station with space included for refuge staff, collaborative interpretive exhibits, Friends group office, and bookstore with opportunities to market Tribal and locally produced merchandise.

Goal 5. Carlton Pond WPA Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, and wildlife at Carlton Pond WPA.

Objective 5.1 Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation

Allow visitors at Carlton Pond WPA to participate in wildlife observation and photography, hunting, and fishing to create opportunities for connecting visitors with nature.

Rationale
See alternative A, objectives 4.1, 4.2, 4.3, and 4.4, for discussion of the importance of hunting, fishing, wildlife observation and photography, and environmental education and interpretation to the Refuge System.

Under this alternative, with the addition of staff, we propose developing relationships with local organizations, academic institutions, and schools to provide and promote the use of Carlton Pond WPA for environmental education and interpretive programming. Over the 15-year life of the CCP, we would also begin conducting Service-led environmental education and interpretation programs.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Develop at least one partnership (e.g., with Unity College, the Sebasticook Land Trust) to promote environmental education, interpretation, and public use at Carlton Pond WPA.
- Develop relationships with at least one local school to provide at least one environmental education program or teacher training.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Maintain and update as needed existing signs and develop at least one brochure for Carlton Pond WPA.
- Maintain a few wood duck boxes at Carlton Pond WPA for interpretive purposes and develop an interpretative display or brochure.
- Conduct an average of four interpretive programs (onsite or offsite) each month across all refuge units and Carlton Pond WPA, led by Service staff.

Goal 6. Benton and Sandy Stream Units Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the shrublands, woods, grasslands, and wildlife at the Benton and Sandy Stream Units.

Objective 6.1 Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation

Provide visitors opportunities for wildlife observation and photography, hunting, and fishing at the Benton and Sandy Stream Units to create opportunities for connecting visitors with nature.

Rationale
See alternative A, objectives 4.1, 4.2, 4.3, and 4.4, for discussion of the importance of hunting, fishing, wildlife observation and photography, and environmental education and interpretation to the Refuge System.

As described under alternative A, we would continue to allow local snowmobile clubs to maintain existing snowmobile trails under special use permits at the Benton and at the Sandy Stream Units, which provide for other public use access throughout the year. Under this alternative, however, we would collaborate with those organizations to relocate the snowmobile trail at Sandy Stream Unit so it would be closer to Prairie Road, as described in alternative B under objective 3.4, to reduce habitat fragmentation and maximize the riparian buffer width along Sandy Stream itself.

Under this alternative, with the addition of staff, we propose developing relationships with local organizations, academic institutions, and schools to provide and promote the use of Sandy Stream Unit for environmental education and interpretive programming.

Alternative B would also create a pedestrian connector trail at Benton Unit to allow access for wildlife observation and photography from the parking lot, and would open the snowmobile trail to pedestrian traffic during the growing season (see map 3.13).

Strategies
In addition to strategies outlined in alternative A:

- Over the 15-year life of this CCP, collaborate with snowmobile clubs to relocate the snowmobile trail on Sandy Stream Unit closer to the road to provide a more contiguous habitat unit.

- Over the 15-year life of this CCP and with the hiring of at least one full-time position, develop at least one partnership (e.g., with Unity College, the Sebasticook Land Trust) to promote environmental education, interpretation, and public use at Benton and Sandy Stream Units.
- Develop interpretive display and programs (at least one for each unit) to interpret the benefits of grassland management at Benton Unit and riparian buffer management at Sandy Stream Unit.
- Create a 0.25-mile long pedestrian connector trail between the parking lot and existing snowmobile trail at the Benton Unit to allow pedestrian access to the snowmobile trail when not in use by snowmobiles.

Goal 7. Partnership Coordination. Communicate and collaborate with local communities, Federal and State agencies, local and Tribal representatives, and other organizations throughout Maine and the region to further the purposes of the refuge and the mission of the National Wildlife Refuge System.

Objective 7.1 Refuge Friends Group

Support regular interpretive programming and events sponsored by the Friends of Sunkhaze Meadows at the Sunkhaze Meadows Unit by allowing access to refuge facilities, maintaining facilities, and staff involvement.

Rationale
The importance of the Friends of Sunkhaze Meadows is described in objective 7.1 under alternative A. Under this alternative, with the proposed addition of staff, the Service would increase its coordination and support to the Friends organization to support and build the membership that helps us achieve our management goals.

With the proposed addition of staff and establishment of a refuge office facility, we would seek to provide space for the Friends to use as well. This would help improve coordination with Service staff as well as provide a centralized location for the Friends to use for program development and organizational needs.

Strategies
Over the 15-year life of this CCP, pending additional staff

- Increase staff coordination and support the Friends organization through organizing volunteer activities, developing special projects, obtaining grant funding, and providing information and presentations.
- Support the long-term sustainability of the Friends organization through mentoring and training programs, as well as by providing assistance in obtaining capacity building grants for the group.
- Provide office space for the Friends organization in the new refuge visitor contact station and administrative offices, if feasible.

Objective 7.2 Agency, Tribal, Academic, and Other Partnerships

As opportunities arise, work with State agencies, Tribal partners, schools, and others to support interpretive programs and research projects at Sunkhaze Meadows NWR and Carlton Pond WPA.

Rationale

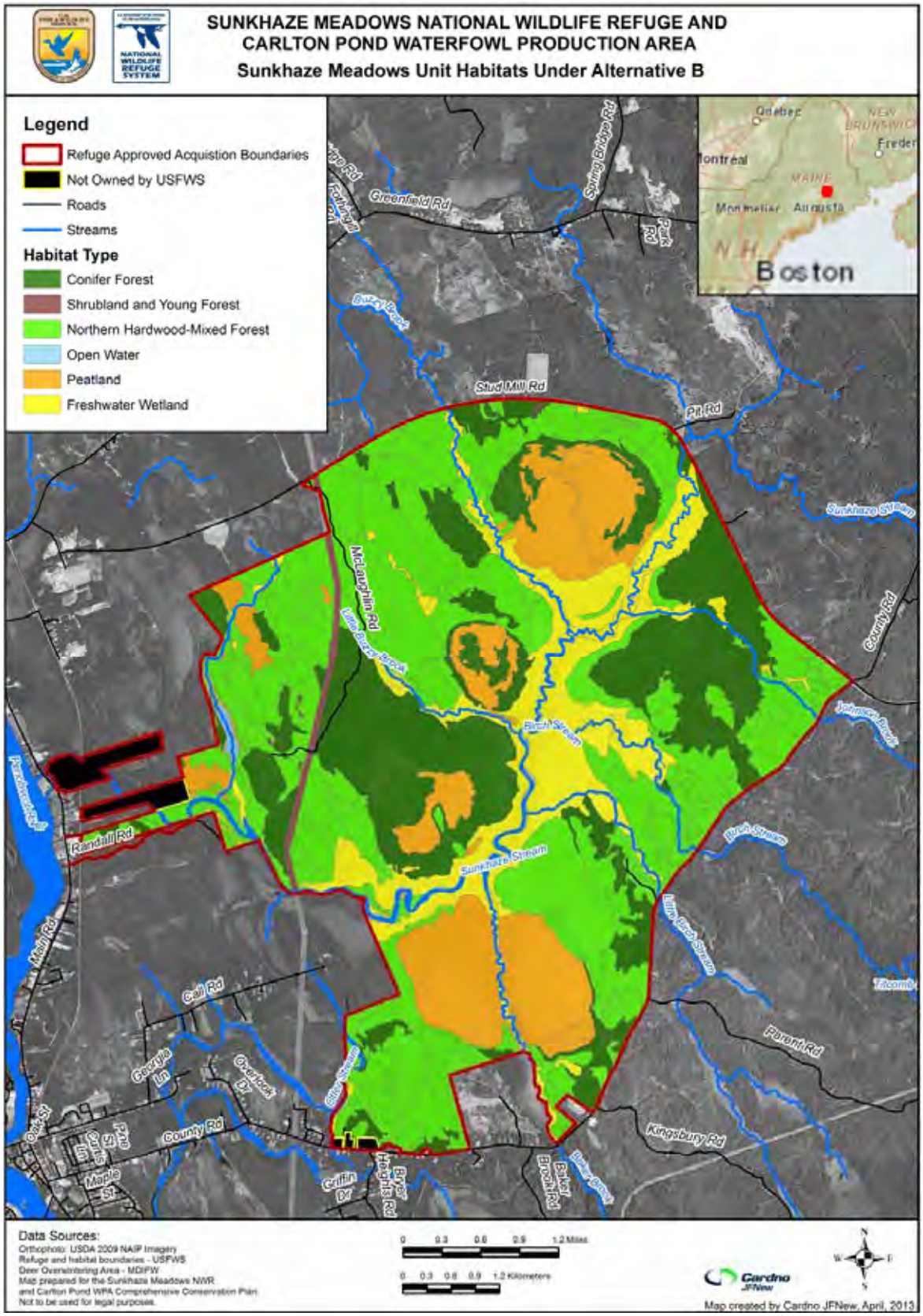
As described in objective 7.2 under alternative A, the Service currently collaborates with State agencies, Tribal partners, universities, schools, or other organizations as opportunities arise. Under this alternative, with the proposed addition of staff, we would increase our collaboration with partners by proactively seeking cooperation in achieving mutual management and public use objectives.

Strategies

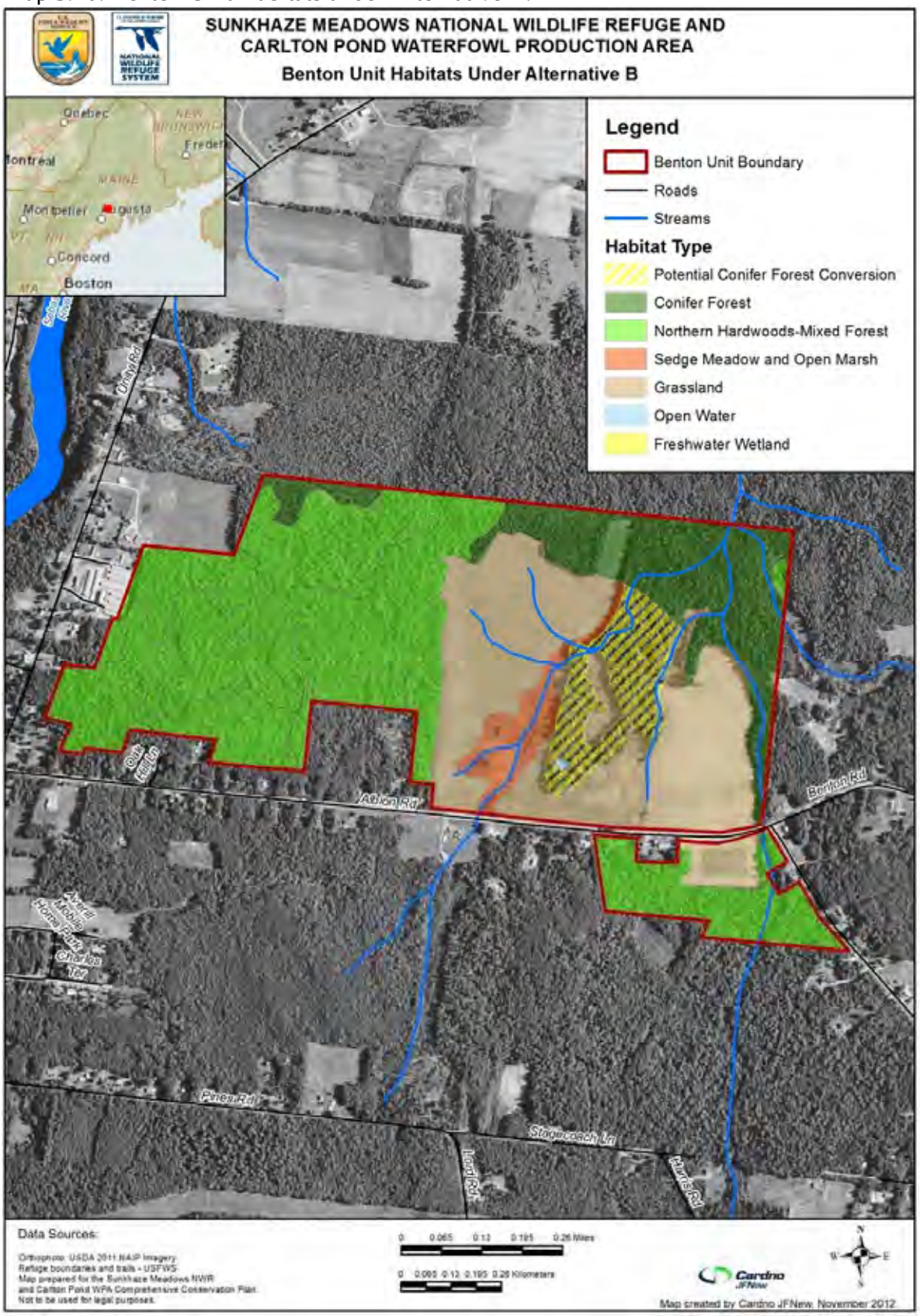
Over the 15-year life of this CCP, with additional staff

- Identify research and monitoring projects and needs at each refuge unit to foster partnerships.
- Establish an annual coordination meeting among Moosehorn NWR, Sunkhaze Meadows NWR, and members of the Penobscot Indian Nation and other Tribes as warranted to collaborate on natural resource and public use management.
- Work with Tribes to identify and quantify existing ash populations when completing other forest inventory work to help determine if sustainable harvest is feasible for Tribal cultural uses.
- Work with partners to ensure consistent refuge and Refuge System messaging in partner-sponsored environmental education and interpretive programming.
- Work with the Penobscot Indian Nation to explore opportunities for developing materials and programming interpreting cultural resources on the refuge.
- Explore partnerships with Unity College, Sebasticook Land Trust, and other partners for assistance in managing and interpreting Benton, Sandy Stream, and Carlton Pond WPA, and conservation within the watershed.
- Explore partnerships with the town of Milford, Penobscot Indian Nation, and others as part of local and regional tourism efforts to promote the Sunkhaze Meadows Unit and the Refuge System mission.

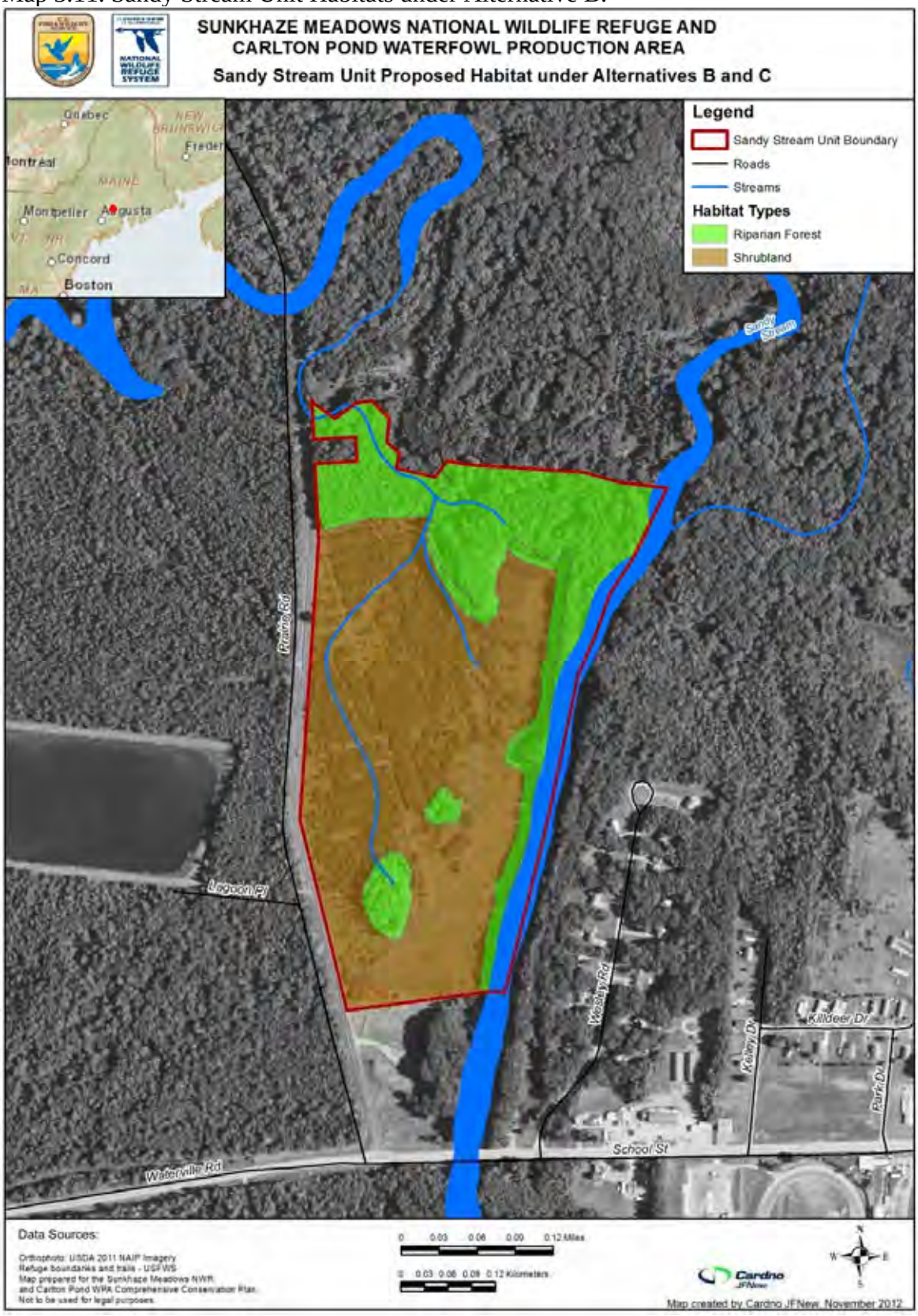
Map 3.9. Sunkhaze Meadows Habitats under Alternative B.



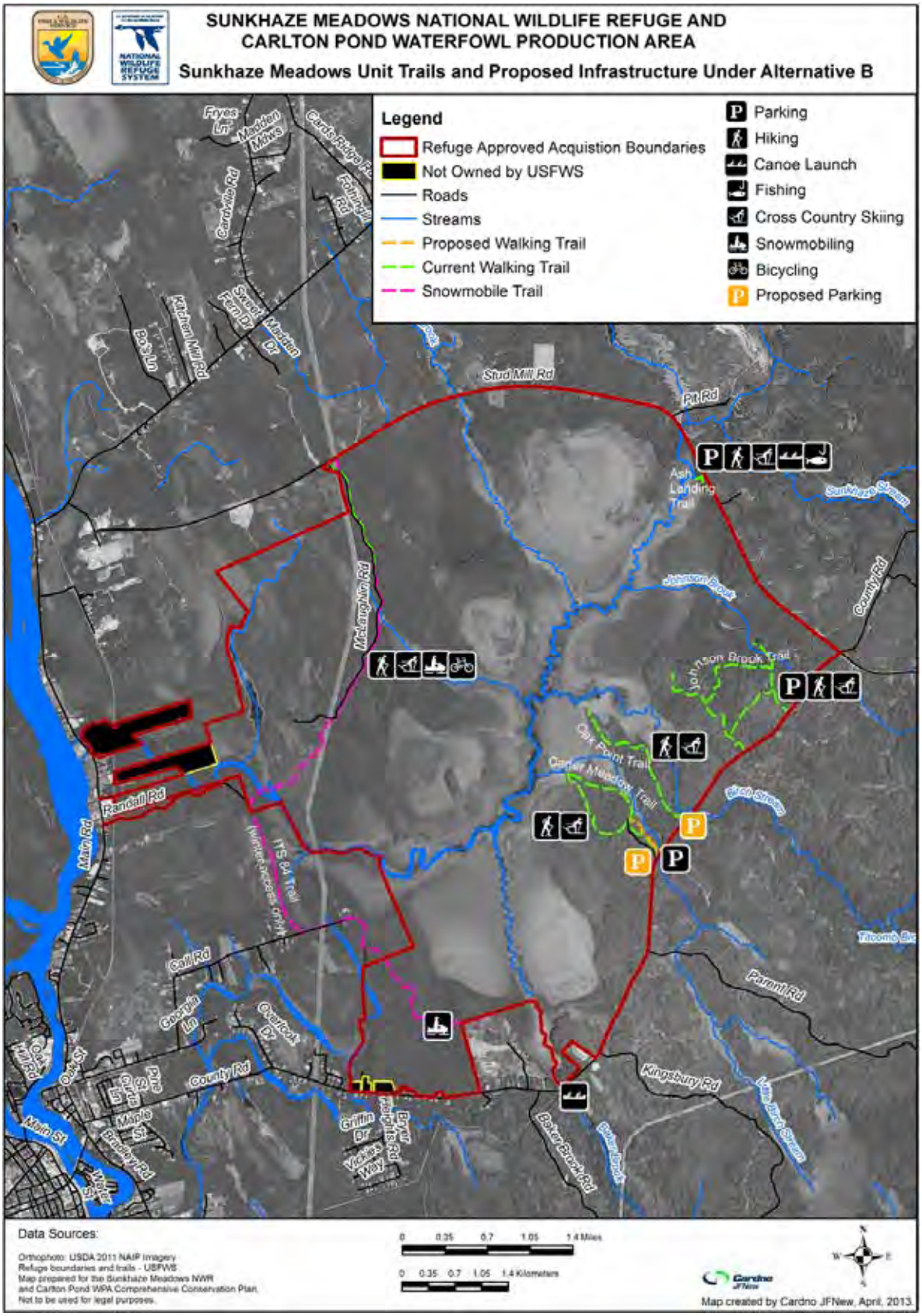
Map 3.10. Benton Unit Habitats under Alternative B.



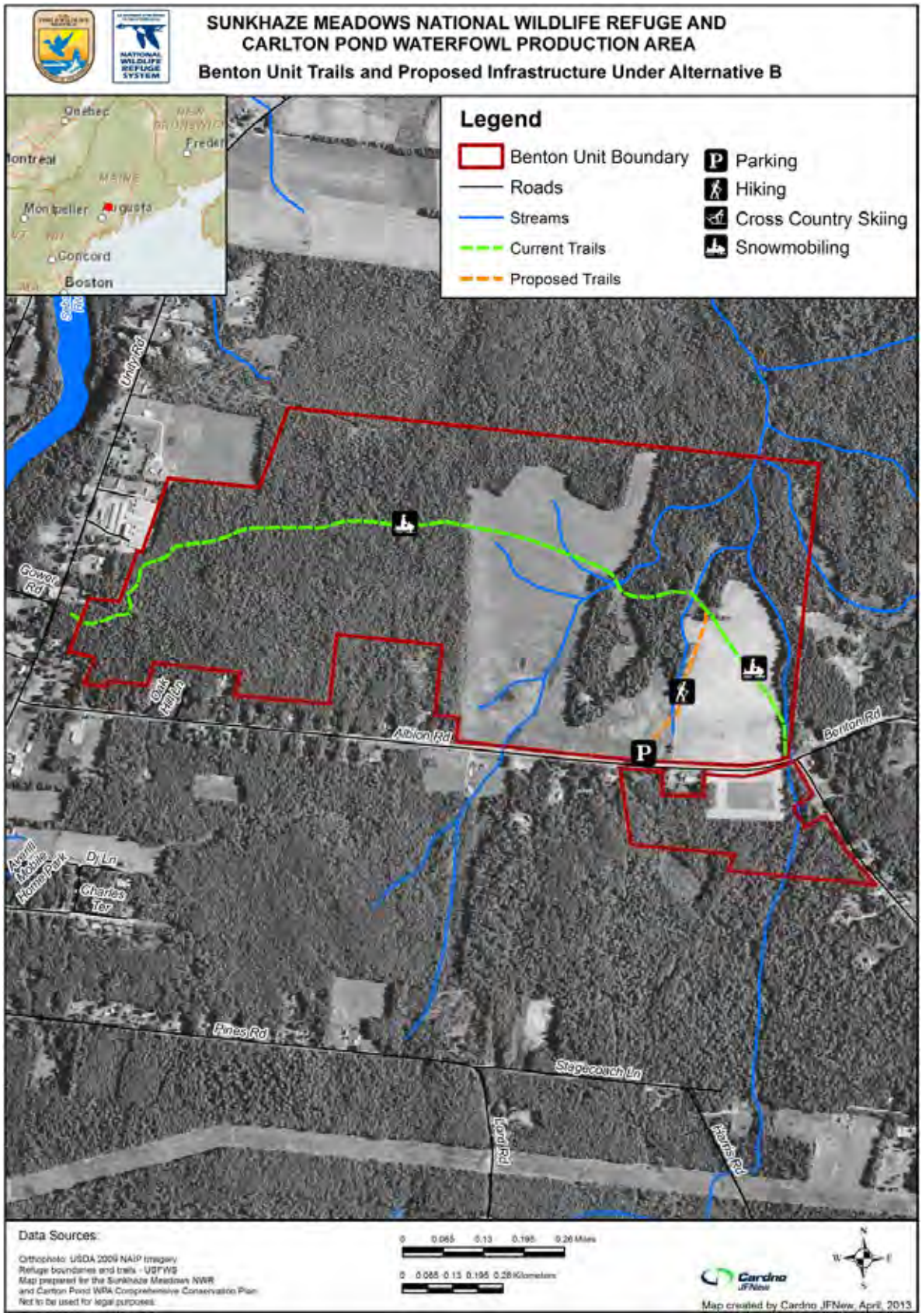
Map 3.11. Sandy Stream Unit Habitats under Alternative B.



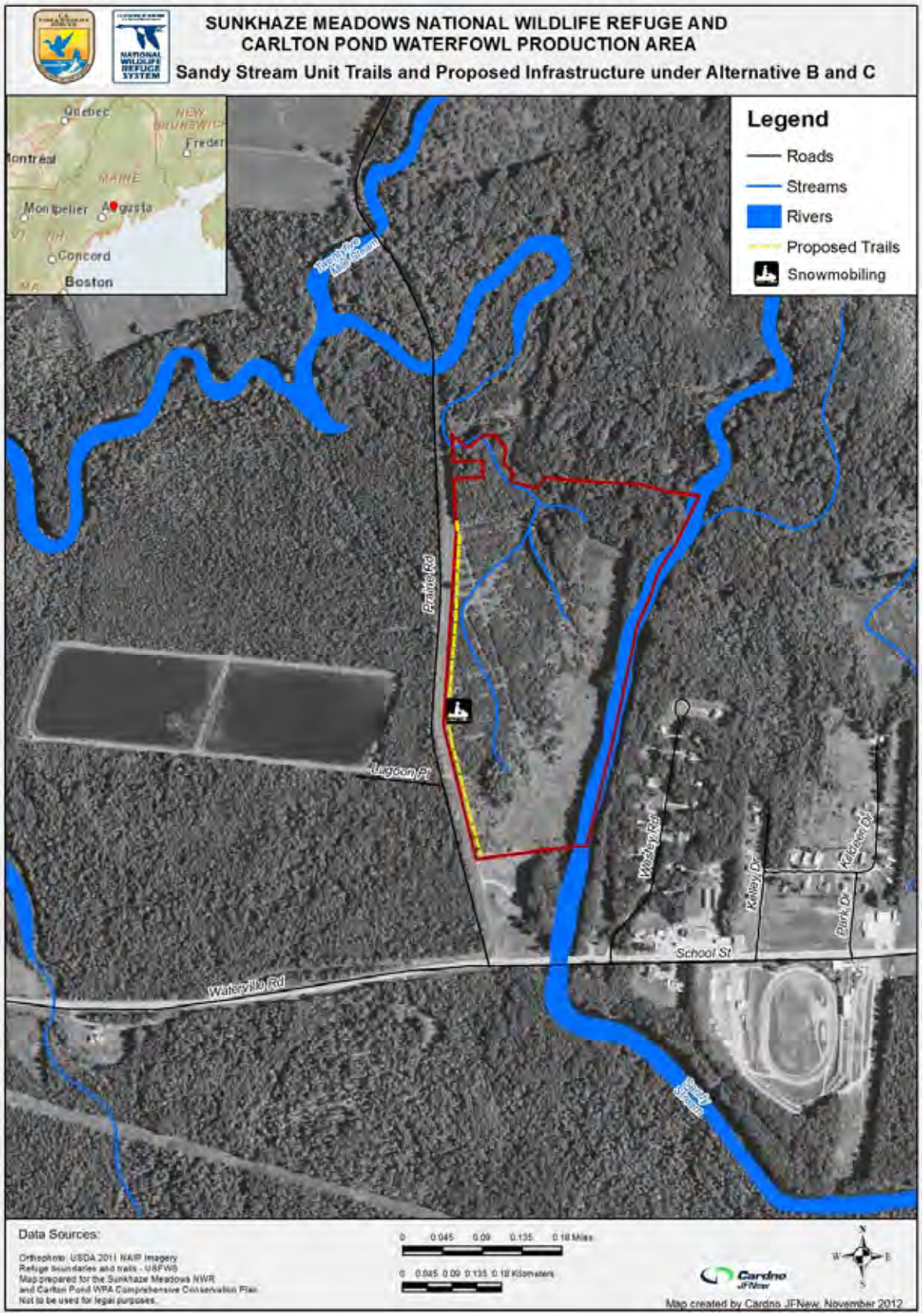
Map 3.12. Sunkhaze Meadows Unit Infrastructure under Alternative B.



Map 3.13. Benton Unit Infrastructure under Alternative B.



Map 3.14. Sandy Stream Unit Infrastructure under Alternative B and C.



Alternative C. Increased Shrub and Young Forest Habitat and Increased Public Use

Under alternative C, we would manage habitat and public use more intensively compared to alternatives A and B. We would focus resources on more shrubland management and less on grassland management at the Benton Unit and actively manage for a large component of young forest (early successional) habitat at the Sunkhaze Meadows Unit.

Habitat Management

Habitat management under alternative C emphasizes shifting management of some refuge lands to shrubland and young forest habitat within the Sunkhaze Meadow Unit and the Benton Unit. This would benefit species such as the chestnut-sided warbler and the American woodcock that rely on these habitats. Management of the Sandy Stream Unit and Carlton Pond WPA would be similar to alternative B.

Refuge Administration

Under alternative C, we would also work closely with partners to increase and enhance the public use experience at all refuge units and Carlton Pond WPA. As staffing is increased (as proposed under alternatives B and C), we would enhance public use of Sunkhaze Meadows NWR and Carlton Pond WPA by increasing Service-sponsored programming and increasing maintenance of public use infrastructure such as signs and trails.

Similar to alternative B, the refuge would continue to be administered as a satellite refuge with management responsibility residing at Maine Coastal Islands NWR Complex. We used the national staffing model to help determine the appropriate level of non-law enforcement staffing for alternative C, and the law enforcement deployment model to determine the proposed number of law enforcement staff. The staff for Sunkhaze Meadows NWR and Carlton Pond WPA would continue to be supported by staff at Maine Coastal Islands NWR Complex. To provide facilities if additional staff is hired in future, the Service would identify and acquire an appropriate site for refuge management facilities, located on or near Sunkhaze Meadows Unit. Please see appendix E for the proposed staffing chart for alternative B.

While proposed full time staffing is similar to alternative B, we propose adding seasonal staff under alternative C to accomplish the proposed additional active habitat management and enhanced public use programs. Similar to alternative B, we would propose adding staff positions, following the national staffing model of four full-time employee positions:

- One wildlife refuge specialist
- One park ranger (visitor services)
- One wildlife biologist
- One maintenance worker

In addition, alternative C would also involve adding two seasonal workers:

- One seasonal biological technician
- One seasonal maintenance worker

Actual staffing levels are subject to approval of the Service's Northeast Region Assistant Regional Director of the Refuge System and are based on Federal budget allocations. This document does not represent a commitment of resources. While a few of the strategies proposed could be implemented at current funding and staffing levels, many would depend on additional funding and staff.

Law enforcement presence would increase to one full-time law enforcement position dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA.

Public Use

Similar to alternative B, under alternative C, we would work closely with partners to increase and enhance the public use experience at all refuge units and Carlton Pond WPA. If staffing is increased as proposed under alternative C, we would enhance public use of Sunkhaze Meadows NWR and Carlton Pond WPA by increasing Service-led programming and updating and maintaining public use infrastructure, such as signs and trails, more so than the level proposed under alternative B.

In the section that follows, we describe in detail the goals, objectives, and strategies we would implement under alternative C.

Goals, Objectives, and Strategies under Alternative C

Goal 1. Sunkhaze Meadows Biological Management. Promote the environmental health of Sunkhaze Meadows Unit wetland, forest, and aquatic habitats to protect water quality and sustain native rare plants, natural communities, and wildlife, including species of conservation concern.

Objective 1.1 Sunkhaze Meadows Unit: Freshwater Wetland-Peatland Complex

Conserve the 3,461-acre freshwater wetland-peatland complex on Sunkhaze Meadows Unit that includes open water, marsh, beaver marsh, and shrub swamp to protect and buffer the ecological integrity of the 1,649 acres of peatland, protecting water quality, rare plants, and habitat for American black duck and other breeding waterfowl, bitterns, sedge wren, yellow rail, rusty blackbird, and other wetland-peatland dependent-species. Specifically, by maintaining

- Water that is clear of turbidity and free of environmental contaminants at concentrations injurious to fish and wildlife.
- Peatland with the full assemblage of native plants including rare Bog Bedstraw and Showy Lady's Slipper, and less than five percent cover of invasive nonnative plants such as purple loosestrife.
- Continued presence of beaver activity and minimal human disturbance to support American black duck breeding (Diefenback and Owen 1989).

Rationale

The regional importance and unique characteristics of the Sunkhaze Meadows freshwater wetland-peatland complex are described previously under objective 1.1, in alternatives A and B.

Strategies
Same as alternative B.

Objective 1.2 Sunkhaze Stream and Aquatic Habitats

Preserve the 17 miles of Sunkhaze Stream and its tributaries that flow through the refuge to protect the water quality and biological integrity by maintaining vegetated streambanks and safeguarding the absence of human-created barriers (physical, chemical, or thermal) along the stream in order to benefit native species like Atlantic salmon, brook trout, wood turtles, and breeding and migrating birds like American black duck. In particular, maintain waters that have low turbidity levels, suitable dissolved oxygen levels, suitable water temperatures, and are free of environmental contaminants at concentrations injurious to fish and wildlife.

Rationale
The Sunkhaze Meadows Unit encompasses 5 miles of the approximately 20-mile Sunkhaze Stream, which bisects the refuge along a northeast to southwest orientation. The refuge has another 16 miles of tributary streams that include Buzzy, Little Buzzy, Baker, Dudley, and Johnson Brooks, and Birch and Little Birch Streams. The importance and characteristics of these riverine systems is described previously under objective 1.2 in alternatives A and B.

Strategies
Same as alternative B.

Objective 1.3 Sunkhaze Meadows Unit: Northern White Cedar Woodland Fen and Cedar–Spruce Seepage Forest

Protect the 390-acre exemplary northern white cedar woodland fen at Sunkhaze Meadows Unit, to ensure a continued canopy dominated by northern white cedar ranging between 4 to 23 inches diameter DBH, with 20 to 60 percent canopy closure, and less than 5 percent invasive plant species cover, and to maintain the population of the State-threatened showy lady's slipper, and to provide habitat for species of conservation concern that breed in this habitat type including boreal chickadee and Canada warbler.

Rationale
The regional importance and unique characteristics of the Sunkhaze Meadows exemplary northern white cedar woodland fen and cedar–spruce seepage forest are described previously under objective 1.3 in alternatives A and B.

Strategies
Same as alternative B.

Objective 1.4 Sunkhaze Meadows: Conifer and Northern Hardwood-Mixed Forests

Manage 2,849 acres of conifer and 4,342 acres of northern hardwood–mixed forests on the Sunkhaze Meadows Unit to promote a self-sustaining, mature forest characteristic of the Atlantic northern forest, to benefit a suite of species of conservation concern in BCR 14 including bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, olive-sided flycatcher, black-throated blue warbler, wood thrush, and chestnut-sided warbler. Forests should include trees greater than 70 years old, some trees more than 100 years old, canopy dominated by

shade tolerant species, trees greater than 16 inches DBH, presence of large logs on forest floor, presence of trees with long (greater than 6 inches) *Usnea* spp. (lichen), and presence of *Collema* and *Leptogium* lichen species.

Rationale

In addition to the rationale for late successional habitat in alternative B, objective 1.4, under this alternative we would use more active forest management treatments to create and maintain a continuum of forest age classes (e.g. clearcut, pole-sized, late successional) with an emphasis on late successional characteristics (Whitman and Hagan 2007). The overall acreage of conifer and northern hardwood-mixed forests in this alternative would be reduced by 715 acres as a result of early successional management outlined in objective 1.5, which is focused on promoting young forest development (see map 3.16).

Many priority bird species use a range of successional conditions. For example, the yellow-bellied sapsucker is a high priority species in BCR 14. It prefers forests of early successional hardwoods (e.g., aspen and birch), where it accesses tree (especially aspen) sap through a series of holes pecked through the bark. Sapsuckers appear to play an important ecological role in the forest community, as many other animals make use of their sap pools (including insects) as well as the nest cavities they excavate. Sapsuckers also live on dead trees with decay in the center (DeGraaf and Yamasaki 2001); decaying trees are a characteristic common to older forests. Recent research has shown that mature-forest birds use early successional habitats during the post-breeding molt of adult birds and the post-fledging period of juveniles, as well as during migration.

Mature and late successional forests have declined on much of the lands in northern Maine managed as commercial timberlands. In other parts of the State, early successional forest is in decline where forests are maturing and landowners have shifted to light, partial harvests that don’t create larger patches of early successional habitat (Bryan 2007). This shift to partial harvests has potential significant negative impacts on snowshoe hare densities; hare are a prey item for many carnivores including lynx, bobcat, marten, fisher, and coyote. Management strategies that maintain species and structural diversity, forest health and connectivity, and control and prevent invasive species are also important in the face of climate change.

Strategies

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Work with the Service's regional forester to inventory and delineate forest stand types and dominant species within the vicinity of the existing deer yard.
- Work with regional forester to ground truth and update the forest stand land cover type data.
- Work with the State to ensure refuge management for priority species in conifer forest areas does not decrease the quality of potential and existing deer yards.
- Identify the potential for impacts from and monitoring of forest pest species, such as emerald ash borer and Early Detection and Rapid Response.
- Work with the Service's Northern Forest LMRD Biologist stationed at Umbagog NWR to coordinate management with recommendations of the LMRD Program.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Convert 55 acres of existing conifer forest and 660 acres of northern hardwood-mixed forest at the Sunkhaze Meadows Unit to early successional habitat, see objective 1.5.
- During active forest management maintain nut-producing oak and beech trees, snags, cavity trees, and downed woody material to benefit pileated woodpecker and boreal chickadee, and bears.
- Meet or exceed State of Maine best management forestry practices when conducting management activities.
- Manage these forest stands using forest management prescriptions to minimize fragmentation and provide the best mix of forest age class and structural diversity to benefit nesting and migratory birds across the landscape. Consider the most appropriate management of age classes given the surrounding land ownership and management and what unique role the refuge can fulfill over time.
- Seasonal staff would assist permanent staff in inventory and monitoring activities.
- Conduct a forest health and condition assessment, as well as stand exams, to determine the current condition of the forest and its species and structural characteristics and to determine if any active forest management is needed to promote mature spruce-fir forest to benefit priority species (e.g. bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, olive-sided flycatcher, black-throated blue warbler, wood thrush, and chestnut-sided warbler) and other native species (e.g., white-tailed deer).

Objective 1.5 Sunkhaze Meadows Unit: Shrubland and Early Successional Habitat

Work with the utility company on the management of their power line right of way to ensure that the approximately 107 acres of shrubland habitat is maintained, and begin to create an additional 715 acres of young forest habitat dominated by speckled alder, white ash, sweet gale and other shrubs and small trees approximately 2 to 10 feet tall on the Sunkhaze Meadow Unit to provide nesting and feeding habitat for bird species of conservation concern in BCR 14, including chestnut-sided warbler and American woodcock.

Rationale

The importance of shrubland and early successional habitats is summarized previously under alternative B, in objectives 1.5 and 3.4.

We would convert about 715 acres of mature forest to young forest to benefit American woodcock and other priority species that use this habitat. Treatment areas would be selected to minimize fragmentation of mature forest, to use existing access points (e.g., existing refuge roads), as well as focusing on areas that were previously logged or otherwise disturbed. We would harvest patches of existing forest totaling 55 acres of conifer forest and 660 acres of northern hardwoods-mixed forest within the more than 7,191 acres of remaining northern hardwood-mixed forest and conifer forest. The patches of young forest, once cut, would be allowed to re-grow and succeed to mature forest, creating a shifting mosaic of small forest openings within a much larger mature forest. Outside of these managed early successional habitats, we would also continue to allow natural processes to create patches of grassland, shrubland, and young forest within the mature forest. Actual acres produced naturally would vary.

Historically, early successional forest habitat was created by natural disturbances such as flooding, beaver activity, severe storms, landslides, insect outbreaks, tree falls, and fire. It occurs as a relatively short-lived vegetation stage after natural disturbance, agricultural abandonment, or logging (Rosenberg and Hodgman 2000). Historic natural disturbance regimes likely maintained about 1 to 3 percent of the inland northern hardwood forests, more than 10 percent of the coastal pine-oak barrens, and perhaps 7 percent of spruce swamp and spruce flat habitats in early successional habitat (Lorimer and White 2003). Northern New England has seen a recent increase in early successional forest edge and supports the greatest amount in the entire northeastern U.S., with most of this in the industrial forest lands of Maine (Dettmers 2003, Litvaitis 2003).

Many wildlife species associated with young forest habitats are in decline, although perhaps from unusually high population levels in the early 20th century, which resulted from human land use changes. However, today we have denser human settlements, loss of dominant plants such as chestnut, change in ecosystem dynamics, restriction in the extent of beaver flowages, and loss of "stable" native shrubland habitats to development. These changes, combined with a decline in large-scale farming and logging, is generating concern that early successional habitats and their wildlife associates are declining below "natural" historic levels (Litvaitis 2003).

American woodcock are listed as highest priority in the BCR 14 Plan (Dettmers 2006). Singing-ground survey data for 2010 in the Eastern U.S. showed indices for singing male woodcock not significantly different from 2009. There was no significant 10-year trend (2000 to 2010) for woodcock in this region; this marks the seventh consecutive year that the 10-year trend estimate was not significant. The Eastern and Central U.S. survey regions have a long-term (1968 to 2010) declining trend of -1.0 percent per year (Cooper and Parker 2010). The major causes for woodcock 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).

Across the northern latitudes, most woodcock migrate south during October and into November (Gregg 1984, Sepik and Derleth 1993, Sibley 1993). Woodcock return to the north in spring where courtship begins in March or April as males perform displays at dawn and dusk on singing grounds that include natural openings, clearcuts, roads, pastures, lawns, cultivated fields, or reverting farmlands. The use of an opening by a male depends on the quality of the surrounding brood and nesting cover. Females choose nest sites near good brood cover and tend to nest within 500 feet (150 m) of a singing ground. Females typically nest in young, open, second growth, hardwood stands. Good brood cover includes high stem densities of hardwood trees or shrubs in areas with high earthworm numbers such as in moist soils under alder or aspen (USFWS 1996).

Chestnut-sided warbler is a species of high regional responsibility within BCR 14 (Atlantic northern forests) due to its steady decline (Whitham and Hunter 1992) and the region's contribution in supporting over 12 percent of the continental populations (Dettmers 2006). Unlike many bird species, the chestnut-sided warbler responds favorably to certain habitat changes; for example, its highest densities occur in areas cleared and allowed to regenerate with increased vegetation complexity, particularly with a dense cover of shrubs greater than 3 feet tall, and increased mean height of shrubs (Niemi and Hanowski 1984).

In addition to nesting habitat, young forest habitat provides important foraging areas for migratory birds during spring and fall migration. Most migratory birds rely on seeds, fruits, and insects to sustain them through migration. Opportunities to manage shrub and young forest habitat to increase seed, fruit and insect production would be an important consideration. Active management is necessary to maintain this habitat type, as otherwise much of the upland areas would mature into a spruce-fir forest. However, wetland areas would likely remain as shrub habitat. Nonnative, invasive plants are an ongoing threat to wildlife habitats across the country and around the world. We need to continue to be aware of potential new species and identify and treat infestations as early as possible.

Strategies
In addition to strategies outlined in alternative A:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Work with the electric companies to retain native shrubland community in the 107-acre transmission line corridor through the Sunkhaze Meadows Unit.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Initiate conversion of up to 660 acres of northern hardwood – mixed forest and 55 acres of conifer forest to several patches (20 acres or larger) of young forest habitat (see map 3.15).
- Actively maintain shrub and young forest habitats using prescribed fire, cutting, or mowing treatment areas on a rotational basis. Treatment areas would be re-treated approximately every 45 years. This would create habitat dominated by speckled alder, white ash, sweet gale, and other shrubs and small trees. Treatment areas would be selected to minimize fragmentation of mature forest, to take advantage of access routes already established, as well as focusing in areas that have been previously disturbed.

Goal 2. Carlton Pond WPA Biological Management. Promote the environmental health of forest, open water, and emergent wetland habitat at Carlton Pond WPA to benefit waterfowl and sustain a diversity of wildlife including species of conservation concern.

Objective 2.1 Carlton Pond WPA: Open Water – Emergent Marsh

Manage the combined 783 acres of open water (295 acres), emergent marsh (455 acres), 34 acres of treed peat bog on the Carlton Pond WPA to maintain appropriate water levels for the nesting population of State-listed, endangered black terns. Emergent wetlands dominated by pickerel weed, cattail, bulrush, and wild rice with less than 5 percent invasive species cover to sustain breeding habitat for American black duck and other migratory bird species of conservation concern including American bittern, least bittern, and marsh wren.

Rationale
Same as alternative B.

Strategies
Same as alternative B.

Objective 2.2 Carlton Pond: Conifer and Northern Hardwood-Mixed Forest

Preserve the 45 acres of conifer forest and 239 acres of northern hardwood-mixed forest on the Carlton Pond WPA to promote a self-sustaining, mature forest characteristic of the Atlantic northern forest, and to provide a buffer for emergent wetlands as well as migratory bird stopover habitat for a suite of species of conservation concern in BCR 14, including bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, and olive-sided flycatcher. Forests should include trees greater than 70 years old, some trees more than 100 years old, canopy dominated by shade tolerant species, trees greater than 16 inches DBH, presence of large logs on forest floor, presence of trees with long (greater than 6 inches) *Usnea* spp. (lichen), and presence of *Collema* and *Leptogium* lichen species.

Rationale
Same as alternative B. However, under alternative C, with proposed additional seasonal staffing we would work with partners to conduct additional assessments and monitoring.

Strategies
In addition to strategies outlined in alternative B:

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Conduct a forest health and condition assessment, as well as stand exams, to determine the current condition of the forest and its species and structural characteristics, and to determine if any active forest management is needed to promote mature mixed conifer-hardwood forest.
- Explore partnership opportunities to inventory use of forested habitat by migrating priority birds.

Goal 3. Benton and Sandy Stream Biological Management. Promote the environmental health of forest, grassland, and shrubland habitat at Benton and Sandy Stream Units to sustain a diversity of wildlife, including species of conservation concern.

Objective 3.1 Benton Unit: Shrubland Habitat

Allow 92 acres of grassland to convert to native shrubland habitat comprised of alder, willow, hawthorn, viburnums, dogwoods, birch, and aspen. Maintain less than 5 percent invasive plant cover to benefit shrub-dependent species including American woodcock, Canada warbler, willow flycatcher, eastern kingbird, and eastern towhee.

Rationale
The importance of shrubland and early successional habitats is summarized previously under alternative B, in objectives 1.5 and 3.4.

The loss and degradation of naturally maintained shrublands has been extensive throughout New England and beyond. Birds associated with shrubland consistently rank near the top of lists of species showing population declines. Of 40 bird species associated with shrubland habitats, 22 are undergoing significant population declines in eastern North America. Shrubland communities are habitat patches with woody plants typically less than ten feet tall with scattered open patches

of grasses and forbs. Patches dominated by shrub clones (e.g., alder and dogwood) are relatively stable and can last up to 40 years with little management (Tefft 2006). Vegetation structure, microhabitat conditions, and landscape context are the most important habitat features for shrub-dependent birds, rather than specific plant species (Dettmers 2003).

The American woodcock depends on shrub (especially alder) and seedling/sapling stands (0 to 15 years) for foraging (Sepik et al. 1981). Chestnut-sided warblers prefer shrubby, dry areas with small trees. They build their nest in dense vegetation, typically in a low shrub, sapling, or briar (DeGraaf and Yamasaki 2001). The Canada warbler prefers dense undergrowth in cool, moist areas, nesting on or near the ground. The willow flycatcher prefers open, brushy fields often along the edges of wetlands or streams. The eastern kingbird uses open areas with scattered trees or tall shrubs. The eastern towhee occupies dense, brushy fields and scrubby, open forests. All of these species are of conservation concern in Maine (MDIFW 2005). Numerous other shrubland birds would benefit from this management approach at the Benton Unit including field sparrow, gray catbird, and ruffed grouse. The site capability at the Benton Unit provides the opportunity to create shrub habitat across a continuum from wet to dry (see map 3.17), which would benefit a diverse suite of wildlife.

Despite these benefits, conversion to this habitat type also creates additional management constraints for refuge staff. Increased growth of shrubs and small trees can limit vehicular and foot access for conducting habitat management and monitoring efforts. Depending on the timing of mowing and the growth rate of shrubs, specialized equipment and/or contracting may be required to effectively implement long-term habitat management requirements for shrublands. These constraints can limit our ability to effectively monitor and manage for priority species and their associated habitat requirements.

Strategies

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Cease annual mowing and allow 92 acres of grassland to convert to native shrubland habitat comprised of alder, willow, hawthorn, viburnums, dogwoods, birch, and aspen.
- Monitor habitat to prevent establishment of nonnative, invasive species and to determine if active planting of desirable species is necessary.
- Allow 3 acres at the northern end of the unit to convert to forest.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Mow woody growth every 10 years or as needed to maintain target vegetation characteristics and to control invasive plants.

Objective 3.2 Benton Unit: Sedge Meadow, Open Marsh, and Riparian Habitats

Maintain 13 acres of sedge meadow dominated by sedges and grasses averaging 3.5 feet tall and 2.4 acres of emergent marsh-open water dominated by cattail and a mix of sedge species at the Benton Unit to sustain the quality and natural function of the freshwater wetlands as breeding and migratory habitat for species of conservation concern, such as sedge wren, rails, and other wetland-dependent wildlife, and as potential foraging areas for bitterns.

Rationale
Same as alternative B.

Strategies
Same as alternative B.

Objective 3.3 Benton Unit: Northern Hardwoods/Mixed Forest and Conifer Forest

Manage 155 acres of northern hardwood-mixed forest and 74 acres of conifer forest on the Benton Unit to promote a self-sustaining, mature forest characteristic of the Atlantic northern forest, to benefit a suite of species of conservation concern in BCR 14 including northern parula, blackburnian warbler, black-throated blue warbler, and wood thrush. Specifically:

- Forests should include trees greater than 70 years old, with some trees more than 100 years old.
- Forest canopies should be dominated by shade tolerant species with an average DBH greater than 16 inches.
- Large logs should be present on the forest floor.

Rationale
Same as alternative B.

Strategies
Same as alternative B, except we would not explore converting 22 acres of conifer forest to grassland.

Objective 3.4 Sandy Stream Unit: Shrubland Habitat

Manage 37 acres of shrubland habitat dominated by alder species with some gray dogwood and red maple on the Sandy Stream Unit to provide nesting and migratory habitat for birds of conservation concern, such as American woodcock.

Rationale
Same as alternative B.

Strategies
Same as alternative B.

Objective 3.5 Sandy Stream Riparian Habitat

Expand the existing forested riparian buffer to at least 90 feet along Sandy Stream to protect the water quality and biological integrity that sustains native brook trout, rare freshwater mussels, wood turtle, other aquatic organisms, breeding and migrating birds.

Rationale
Same as alternative B.

Strategies
In addition to strategies outlined in alternative B:

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Expand riparian forest width to a minimum of 90 feet by planting selected native trees typical of riparian forests, focusing on species in the middle or northern end of their range to accommodate potential shifts in distribution associated with climate change.

Goal 4. Sunkhaze Meadows Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, wildlife, and cultural resources of the Sunkhaze Meadows Unit.

Objective 4.1 Wildlife Observation and Photography – Sunkhaze Meadows Unit

Provide visitors with opportunities for wildlife observation and photography along six existing walking trails, a new trail, the ITS snowmobile trail (in winter), and a developed boat access at the Sunkhaze Meadows Unit to connect visitors with nature and inspire stewardship in their everyday lives.

Rationale
The importance of environmental education and interpretation to the Refuge System is described in objective 4.4 under alternatives A and B. Under alternative C, the Service would use additional staff, if funded, to expand public use programs and improve access and infrastructure around Sunkhaze Meadows Unit (see map 3.18).

Strategies
In addition to strategies outlined in alternative B:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Improve refuge Web site to encourage visitation by adding trail maps, bird lists, and recent observations.
- Explore partnership with the Friends to provide an organized canoe tour of Sunkhaze Stream.

Over the 15-year life of this CCP and with the hiring of at least three full-time positions and seasonal staff

- Maintain all existing trails including regular repair and maintenance and improve directional trail signs to better identify locations of trailheads for visitors.
- Develop two or more staff-guided canoe or kayak trips per year.
- Complete a series of interpretive infrastructure improvements:
    - Install an observation deck along the Oak Point Trail overlooking the peat bog.
    - Replace boardwalks and eliminate a spur trail along Johnson Brook Trail.
- Expand wildlife observation opportunities by exploring potential for commercially guided canoe and kayak trips along Sunkhaze Stream.

Objective 4.2 Hunting

Annually provide visitors seasonal hunting opportunities for big game, upland game, and migratory game birds at Sunkhaze Meadows Unit to create opportunities for connecting visitors with nature.

Rationale
The importance of hunting to Maine and the Refuge System are described in objective 4.2 under alternative A.

Under alternative C, and similar to alternative B, we propose improvements to the refuge Web site to better inform hunters and trappers regarding refuge-specific requirements.

In contrast to other alternatives, under alternative C we would expand the refuge's coyote hunting season (both day and night hunting) by one month, from March 31st to April 30th. This would extend the refuge's coyote hunting season to provide additional hunting opportunities. According to the State's 2012 hunting regulations, coyote is the only species that can be hunted at night in the spring. We do not know how many hunters currently hunt coyote on the refuge, or if extending the season would attract additional hunters. Some raptors return to the refuge and begin nesting and incubation in April and may be sensitive to this additional disturbance. Therefore, onsite staff would be needed to manage this change to the refuge's hunt program. We would likely institute a permit system to collect information on numbers of hunters, days hunted, and time of day hunters are using the refuge. We would also try to monitor for potential adverse impacts on the refuge's wildlife. Even with additional staff, the unit's size and terrain would make monitoring for additional impacts difficult.

Strategies
In addition to strategies outlined in alternative B:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Expand the refuge-specific coyote hunting season to extend through April 30th at the refuge, providing one additional month of hunting opportunity in the spring.
- Initiate monitoring protocols for potential adverse impacts on the refuge's wildlife as a result of the expanded coyote hunting season.

Objective 4.3 Fishing

Annually provide anglers with access to fishing at Sunkhaze Stream and its tributaries at Sunkhaze Meadows Unit fishing to create opportunities for connecting visitors with nature.

Rationale
The importance of fishing to Maine and the Refuge System are described in objective 4.3, under alternative A.

Rationale for this alternative is the same as what we propose under alternative B except under this alternative, we also propose working with partners to implement a youth fishing day event outside of refuge lands to help connect children to nature. Organizing large events such as these

require large commitments of refuge staff. The eventual addition of staff under alternative C would allow us to commit more resources to undertake events such as this.

Strategies
Same as alternative B, plus:

Within 5 years of CCP approval and with the hiring of at least one full-time position

- Collaborate with partners to sponsor one or more youth fishing events off the refuge.

Objective 4.4 Environmental Education and Interpretation

Over the life of the plan, we would improve environmental education and interpretation at the refuge by developing and implementing Service-led environmental education programs, providing additional support to existing, volunteer-led programs (i.e. Friends of Sunkhaze Meadows), and working with new partners to promote understanding of the refuge and the role of the Refuge System.

Rationale
The importance of environmental education and interpretation to the Refuge System is described in objective 4.4 under alternative A.

Under alternative C, as in alternative B, we would expand upon our current, volunteer-led, environmental education and interpretation opportunities (see alternative A, objective 4.4 for additional information on current opportunities). Under this alternative, assuming additional staff, we would develop relationships with local schools to provide and promote the use of Sunkhaze Meadows Unit for environmental education programming. Over the 15-year life of the CCP, we would regularly conduct a series of Service-led environmental education and interpretation programs as well as continuing to support the ongoing efforts of the Friends of Sunkhaze Meadows.

Similar to alternative B, we would also work closely with partners such as the town of Milford, the Penobscot Indian Nation, and others to develop regional cultural and eco-tourism opportunities to increase refuge visitation.

Over the 15-year life of the CCP, we would work with the Penobscot Indian Nation to develop interpretive materials to better inform refuge visitors about the significance of the lands and waters comprising Sunkhaze Meadows Unit to Penobscot Indian Nation history and culture. Through these partnerships we intend to improve the public’s understanding of the role of the Refuge System.

In contrast to alternatives A and B, alternative C would focus some effort on developing interpretive materials describing the benefits of early successional habitat management.

Strategies
Same as alternative B, plus:

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Develop and interpret a woodcock management demonstration area at Sunkhaze Meadows Unit.

Goal 5. Carlton Pond WPA Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, and wildlife at Carlton Pond WPA.

Objective 5.1 Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation

Allow visitors at Carlton Pond WPA to participate in wildlife observation and photography, hunting, and fishing to create opportunities for connecting visitors with nature.

Rationale
The importance of these public uses to the Refuge System is described in previous objectives under alternative A.

Under this alternative, with the addition of staff, we would begin conducting Service-led environmental education and interpretation programs. A portion of staff resources under the alternative would also be dedicated to maintenance of the existing wood duck boxes for wildlife observation, as well as expanding the coyote hunting season on Carlton Pond WPA by one month until April 30th, the same as described for the Sunkhaze Meadows Refuge.

Strategies
Same as alternative B, plus:

Over the 15-year life of this CCP and with the hiring of at least three full-time positions

- Expand the refuge-specific coyote hunting season to extend through April 30th at the refuge, providing one additional month of hunting opportunity in the spring.

Goal 6. Benton and Sandy Stream Units Public Use. Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the shrublands, woods, grasslands, and wildlife at the Benton and Sandy Stream Units.

Objective 6.1 Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation

Provide visitors with access opportunities at the Benton and Sandy Stream Units for wildlife observation and photography, hunting, and fishing to create opportunities for connecting visitors with nature.

Rationale
Under alternative C, much of the proposed resources would focus on developing a trail at the Benton Unit to promote access for public use (see map 3.19). Similar to alternative B, we would also collaborate with the local snowmobiling organizations to move the snowmobile trail at Sandy Stream Unit and ensure maintenance is completed in accordance with refuge habitat goals.

Strategies
Same as alternative B, plus:

Over the 15-year life of this CCP

- Create and maintain 3.4 miles of hiking trails at Benton Unit to expand access for wildlife observation and photography, as well as environmental education and interpretation.
- Expand coyote hunting by one month to be consistent with the State season.

Goal 7. Partnership Coordination. Communicate and collaborate with local communities, Federal and State agencies, local and Tribal representatives, and other organizations throughout Maine and the region to further the purposes of the refuge and the mission of the National Wildlife Refuge System.

Objective 7.1 Refuge Friends Group

Support regular interpretive programming and events sponsored by the Friends of Sunkhaze Meadows NWR at the Sunkhaze Meadows Unit through access, facilities maintenance, and staff involvement.

Rationale
Same as alternative B.

Strategies
Same as alternative B.

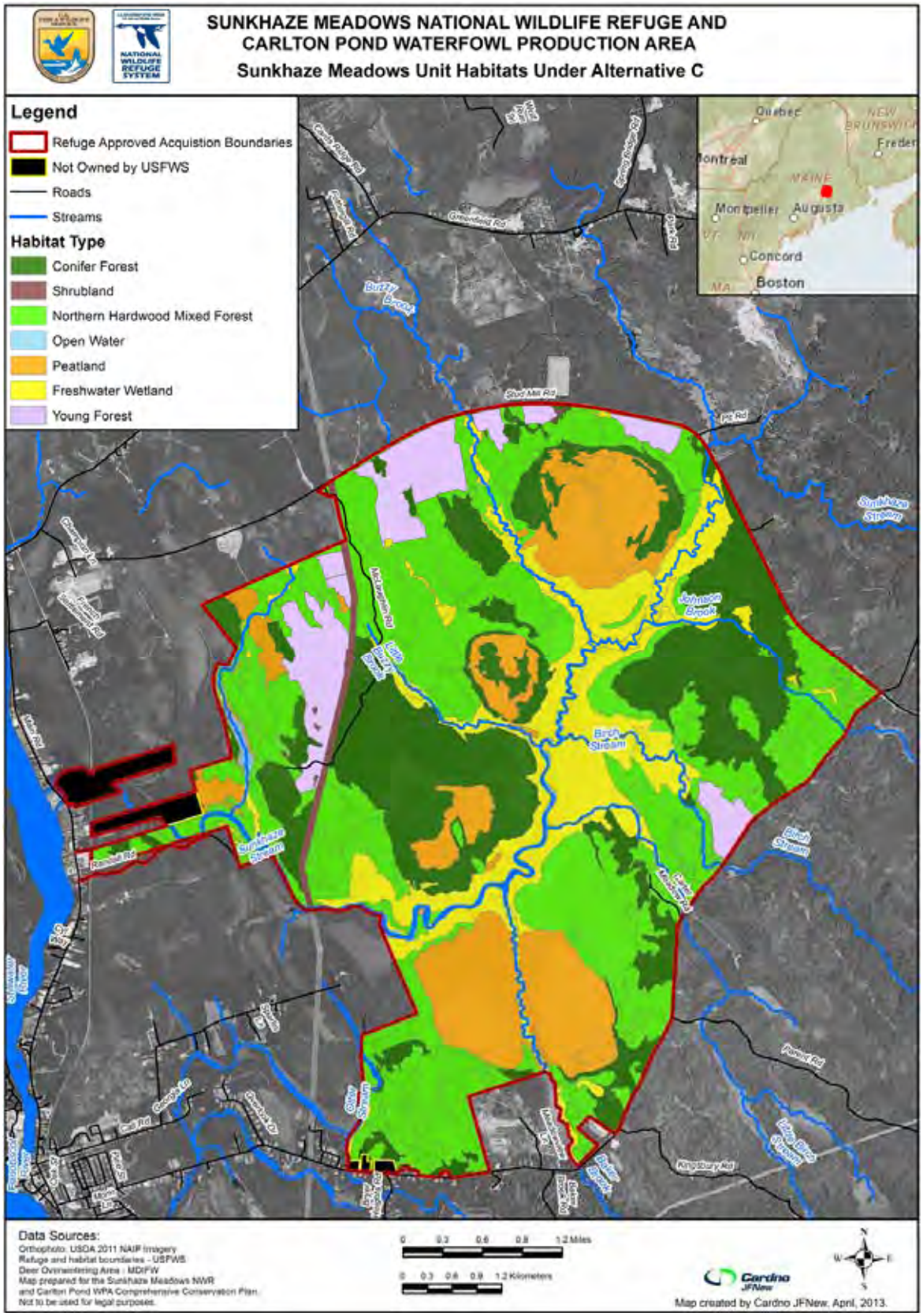
Objective 7.2 Agency, Tribal, Academic, and Other Partnerships

As opportunities arise, work with State agencies, Tribal partners, and universities to support interpretive programs and research projects at Sunkhaze Meadows NWR and Carlton Pond WPA.

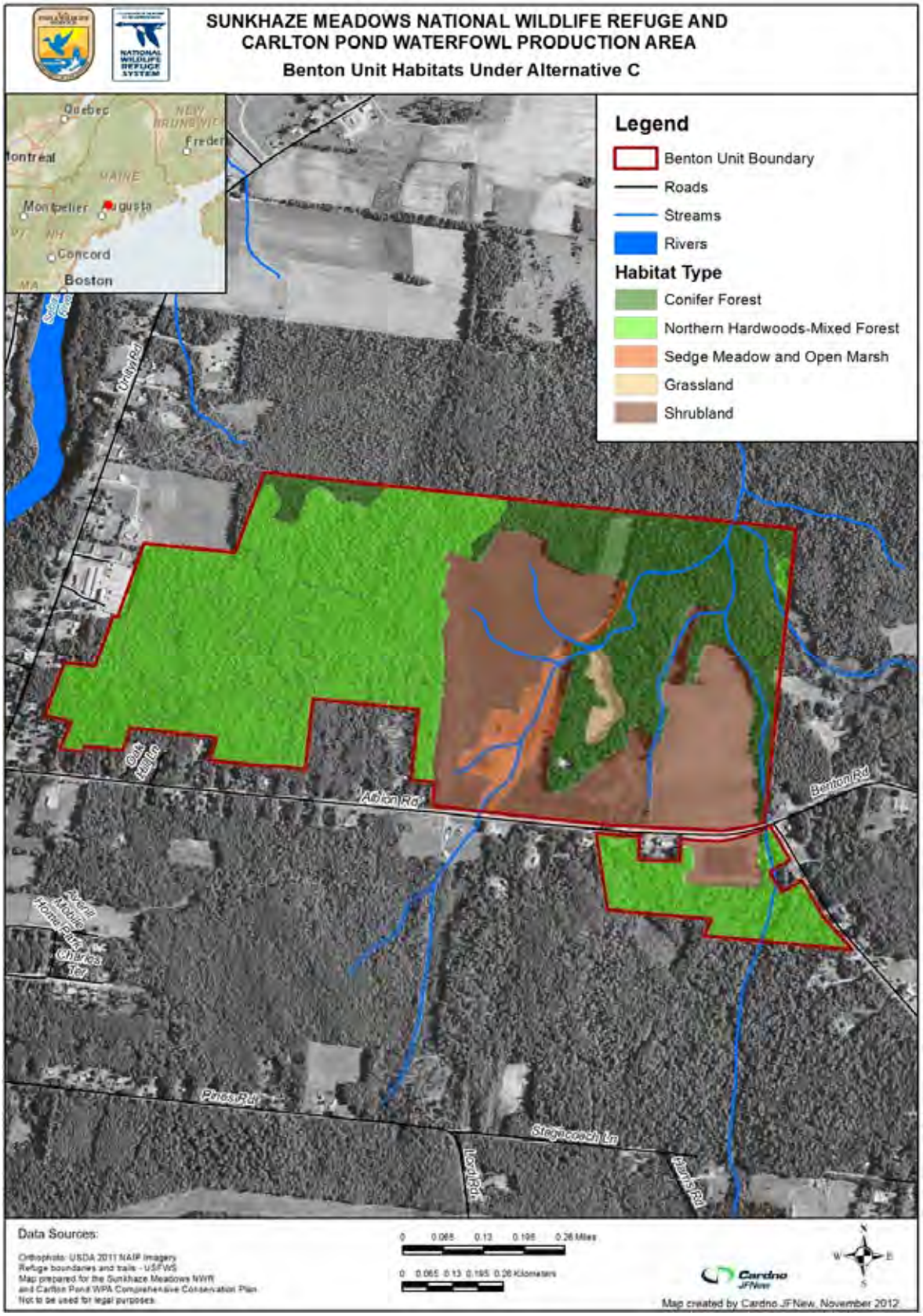
Rationale
Same as alternative B.

Strategies
Same as alternative B.

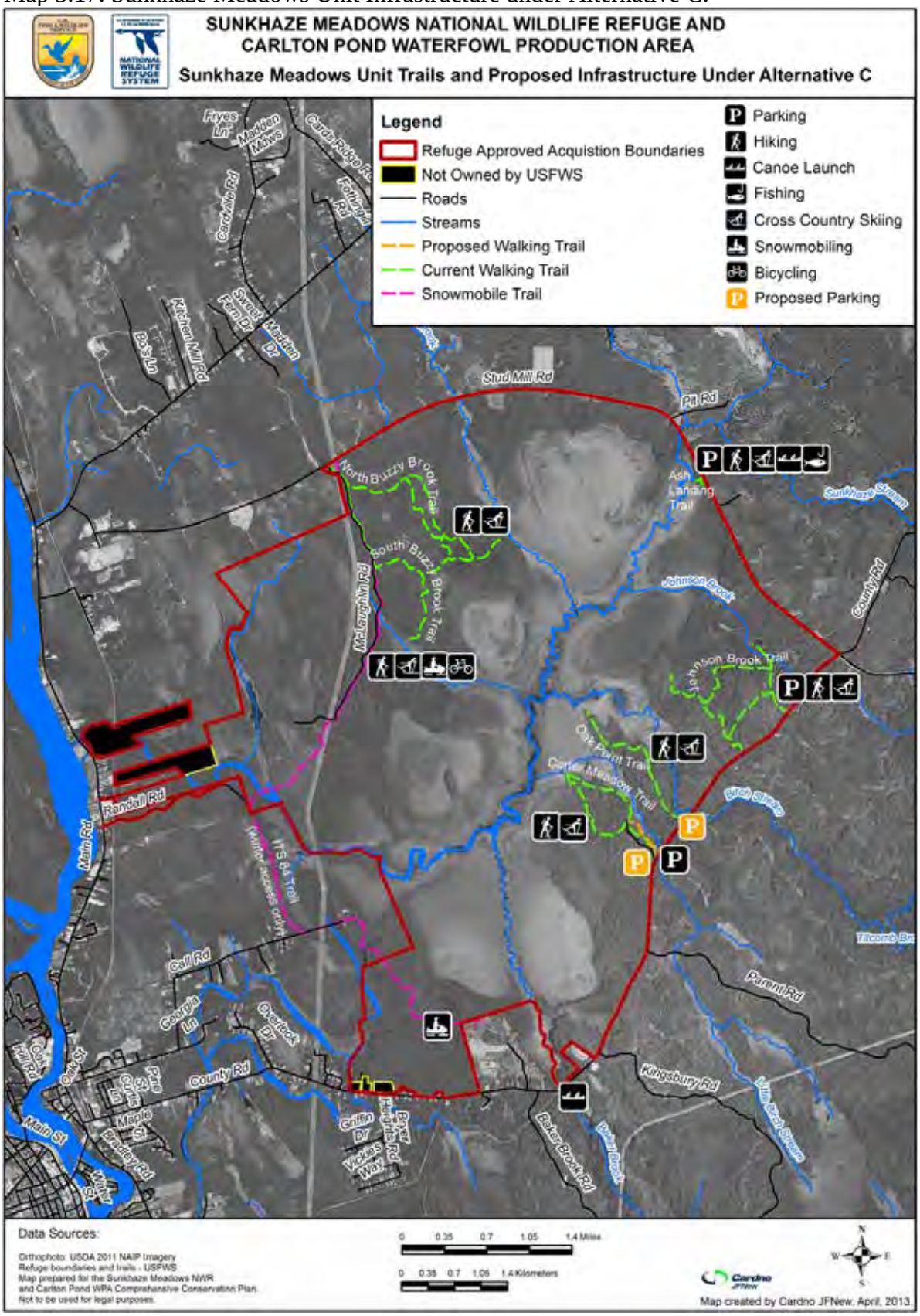
Map 3.15. Sunkhaze Meadows Unit Habitats under Alternative C.



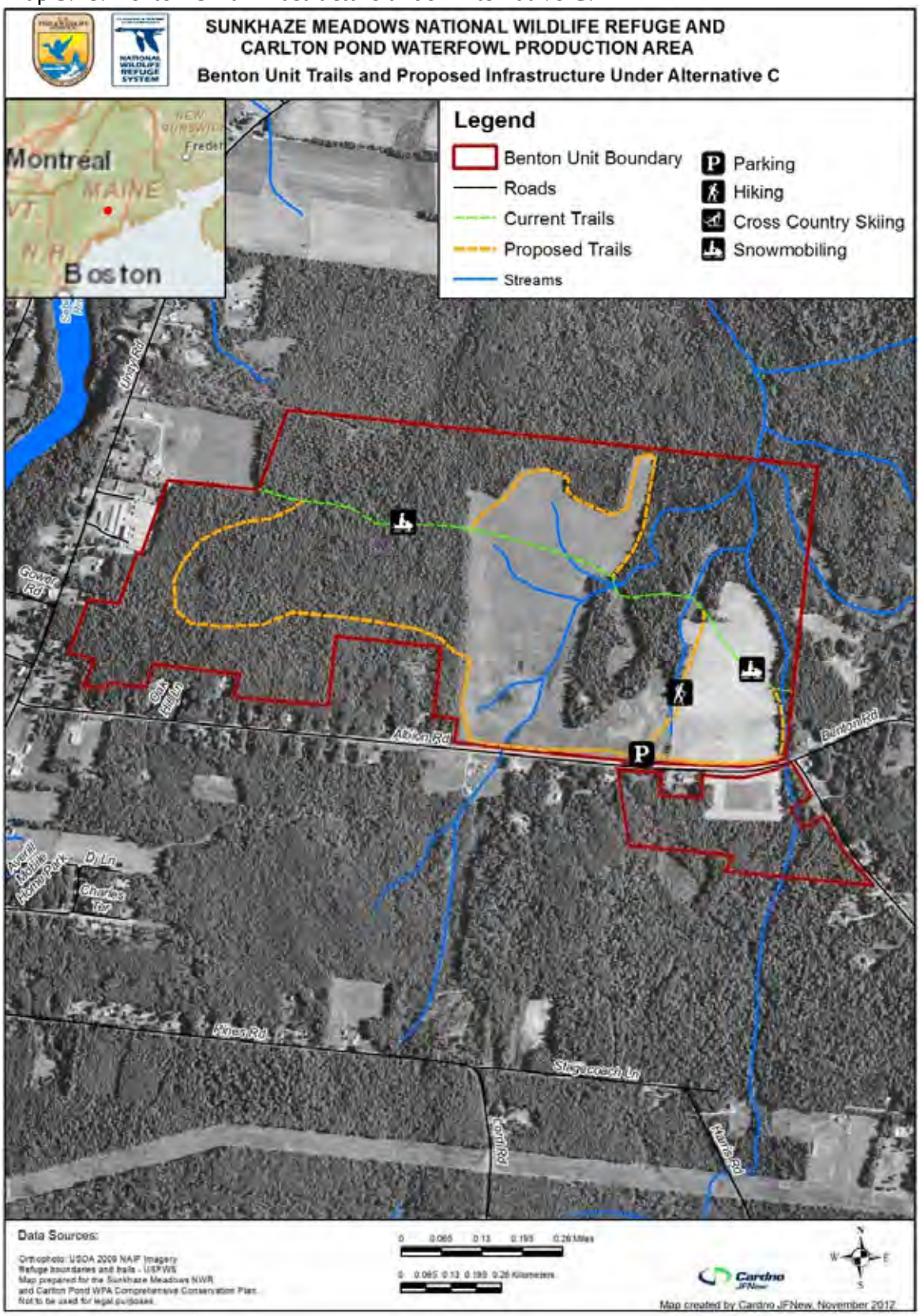
Map 3.16. Benton Unit Habitats under Alternative C.



Map 3.17. Sunkhaze Meadows Unit Infrastructure under Alternative C.



Map 3.18. Benton Unit Infrastructure under Alternative C.



Comparison of Alternatives

The following tables display the comparison of alternatives A through C as discussed throughout this chapter. Table 3.1 is a comparison of strategies discussed throughout the chapter between alternatives A through C.

Table 3.1 Sunkhaze Meadows NWR and Carlton Pond WPA – Habitats by Alternative

Sunkhaze Meadows Unit			
Habitat Type	**Alt A**	**Alt B**	**Alt C**
Freshwater Wetland	1,654	1,654	1,654
Open Water	158	158	158
Peatland	1,649	1,649	1,649
Northern Hardwood-Mixed Forest	5,000	5,002	4,342
Conifer Forest	2,904	2,904	2,849
Grassland	0	0	0
Shrubland	0	107	107
Young Forest Habitat	119	10	725
Total*	**11,484**	**11,484**	**11,484**

Benton Unit			
Habitat Type	**Alt A**	**Alt B**	**Alt C**
Northern Hardwoods-Mixed Forest	155	155	155
Conifer Forest	71	52 or 74*	74
Grassland	95	92 or 114*	0
Shrubland	0	0	92
Sedge Meadow and Open Marsh	13	13	13
Total	**334**	**334**	**334**

*These numbers include the potential conversion of 22 acres of conifer forest to grassland under alternative B.

Sandy Stream Unit			
Habitat Type	**Alt A**	**Alt B**	**Alt C**
Shrubland	39	37	37
Grassland	0	0	0
Riparian Forest	19	21	21
Total	**58**	**58**	**58**

Carlton Pond WPA			
Habitat Type	**Alt A**	**Alt B**	**Alt C**
Freshwater Wetland	455	455	455
Open Water	295	295	295
Treed Peat Bog	34	34	34
Northern Hardwood-Mixed Forest	239	239	239
Conifer Forest	45	45	45
Young Forest	0	0	0
Total	**1,068**	**1,068**	**1,068**

Table 3.2. Comparison of Actions by Alternative

Common to all Alternatives
Continue to purchase portions of the remaining 92 acres within the acquisition boundary of Sunkhaze Meadows Unit from willing sellers as resources allow. Continue to control priority invasive plants. Continue to allow trapping according to State regulations at Sunkhaze Meadows Unit and Carlton Pond WPA.
Common to Alternatives B and C
Use results from the cultural resource surveys to develop a cultural resource management plan. Explore partnership opportunities to inventory use of habitat by reptiles, amphibians, and priority birds of conservation concern. Explore partnership opportunities to monitor or research variables related to climate change on Service-owned lands.

	Alternative A **Current Management**	**Alternative B** **Service-Preferred Alternative**	**Alternative C** **Intensive Management and Increased Public Use and Facilities**
Refuge Resource or Program			
Refuge Staffing and Administration			
	Maine Coastal Islands NWR staff would continue to spend about 5 percent of their time annually to manage the Sunkhaze Meadows NWR and Carlton Pond WPA. Use annual maintenance budget of $5,800.	If authorized and funded, add four staff based out of the Sunkhaze Meadows Unit: 1 – wildlife refuge specialist 1 – park ranger (visitor services) 1 – refuge biologist 1 – maintenance worker	If authorized and funded, add the following staff based out of the Sunkhaze Meadows Unit: 1 – wildlife refuge specialist 1 – park ranger (visitor services) 1 – refuge biologist 1 – maintenance worker Plus: 1 – seasonal biological technician 1 – seasonal maintenance worker
Refuge Buildings and Facilities			
	Maintain existing buildings at Sunkhaze Meadows Unit	Eliminate all unused buildings, including cabins, from refuge lands. Identify and acquire an appropriate site for refuge management facilities on or near Sunkhaze Meadows Unit.	Same as alternative B.
Resource Protection and Visitor Safety			
	Maintain law enforcement presence 2 days per week using staff from Maine Coastal Islands NWR.	Add one full-time law enforcement position dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
Goal 1: Promote the environmental health of Sunkhaze Meadows Unit wetland, forest, and aquatic habitats to protect water quality and sustain native rare plants, natural communities, and wildlife, including species of conservation concern.			
Objective 1.1 Sunkhaze Meadows: Freshwater Wetland and Peatland Complex			
	Conserve the 3,461-acre freshwater wetland-peatland complex on Sunkhaze Meadows Unit.	Conserve the 3,461-acre freshwater wetland-peatland complex on Sunkhaze Meadows Unit that includes open water, marsh, beaver marsh, and shrub swamp to protect and buffer the ecological integrity of the 1,649 acres of peatland.	Same as alternative B.
Strategies to Achieve Objective 1.1	Control invasive species infestations as opportunities arise. Continue to allow natural processes to maintain the wetland system.	In addition to the strategies listed under alternative A: <u>Within 5 years of CCP approval:</u> Limit invasive plant infestation to less than 5 percent of the area. Develop baseline monitoring protocols for climate change monitoring. Conduct migratory and breeding bird surveys to detect presence/absence and long-term trends. Focus on priority species of conservation concern. <u>Over the life of the plan:</u> Develop an index of ecological integrity to measure biological diversity, integrity, and environmental health. Evaluate the effectiveness of allowing natural processes to maintain the ecological communities of the peatlands. Explore establishing a waterfowl banding program.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		Use standard protocols to conduct migratory and breeding bird surveys	
Objective 1.2 Sunkhaze Stream and Aquatic Habitats			
	Preserve the 17 miles of Sunkhaze Stream and its tributaries.	Preserve the 17 miles of Sunkhaze Stream and its tributaries to benefit native species.	Same as alternative B.
Strategies to Achieve Objective 1.2	No active management of Sunkhaze Stream or its tributaries.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Evaluate surrounding land uses at least every 2 years for potential impacts on water quality in refuge waterways. <u>Over the life of the plan:</u> Work with partners to protect streams and riparian areas by implementing BMPs within the Sunkhaze Stream watershed. Monitor brook trout populations in collaboration with MDIFW, Penobscot Indian Nation, and other partners.	Same as alternative B.
Objective 1.3 Sunkhaze Meadows: Northern White Cedar Woodland Fen			
	Preserve the 390-acre exemplary northern white cedar woodland fen at Sunkhaze Meadows Unit.	Protect the 390-acre exemplary northern white cedar woodland fen at Sunkhaze Meadows Unit.	Same as alternative B.
Strategies to Achieve Objective 1.3	Control invasive species if potential threats are identified within this habitat. Cooperate with the Maine Natural Areas Program to monitor populations of showy lady's slipper.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Assess regeneration of northern white cedar forest. Evaluate the impact of white-tailed deer browsing on the showy lady's slipper and northern white cedar regeneration.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		Over the life of the plan: Conduct annual migratory and breeding bird surveys for identified focal species. Work with partners to develop an index of ecological integrity for the northern white cedar seepage forest. Collect baseline data and monitor for habitat changes, particularly changes potentially associated with climate change.	
Objective 1.4 Sunkhaze Meadows: Conifer and Northern Hardwood-Mixed Forests			
	Preserve 2,904 acres of conifer and 5,000 acres of northern hardwood–mixed forests on the Sunkhaze Meadows Unit.	Manage and preserve 2,904 acres of conifer and 5,002 acres of northern hardwood – mixed forests on the Sunkhaze Meadows Unit.	Manage 2,849 acres of conifer and 4,342 acres of northern hardwood – mixed forests on the Sunkhaze Meadows Unit.
Strategies to Achieve Objective 1.4	Control invasive plants, insects, and disease outbreaks as resources allow.	Same as alternative A, plus: Within 5 years of CCP approval: Work with a Service forester and MDIFW to improve conifer forest habitat quality (e.g., by managing for multi-age stands) to benefit priority species and other native species (e.g., deer). Over the life of the plan: Manage remaining 2,904 acres of forest stands using best management practices to promote forest health by providing a mix of forest age class and structural diversity. Prior to any active forest management, survey for presence of any vernal pools	Same as alternative A, plus: Within 5 years of CCP approval: Work with a Service forester to inventory and delineate forest stand types and dominant species within the vicinity of the existing deer yard. Protect conifer forest areas that provide existing deer yards. Identify and quantify existing ash populations to assist in determining sustainable harvest levels for Tribal cultural uses. Over the life of the plan: Convert 55 acres of existing conifer forest

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		and implement appropriate seasonal restrictions or buffer zones. Work with the Penobscot Indian Nation to identify and quantify existing ash populations and assess potential for sustainable harvest levels for Tribal cultural uses. Monitor rare plant populations and the 100-acre exemplary floodplain forest in collaboration with the Maine Natural Areas Program.	and 660 acres of existing northern hardwood-mixed forest to early successional shrubland habitat. Manage forest stands using best management practices to promote forest health by providing a mix of forest age class and structural diversity. Monitor rare plant populations and the 100-acre exemplary floodplain forest in collaboration with the Maine Natural Areas Program. Conduct migratory and breeding bird surveys to detect presence/absence and long-term trends. Focus on priority species.
Objective 1.5 Sunkhaze Meadows NWR: Grassland, Shrubland, and Young Forest Habitat			
	On the existing 107 acres of power line right-of-way, the access corridor is to be regularly maintained as grassland and shrubland on the Sunkhaze Meadow Unit.	Work with the utility company on the management of their power line right-of-way to ensure that the approximately 107 acres of grassland and shrubland habitat within the right-of-way are maintained to benefit species of conservation concern. Allow the 2 acres of early successional habitat near the Johnson Brook Trails to transition into late successional forest.	Work with the utility company on the management of their power line right-of-way to ensure that the approximately 107 acres of grassland and shrubland habitats are maintained and begin to create an additional 725 acres of young forest habitat on the Sunkhaze Meadow Unit for bird species of conservation concern in BCR 14, including chestnut-sided warbler and American woodcock.
Strategies to Achieve Objective 1.5	Allow the 107-acre transmission line corridor to be maintained using standard right-of-way clearing techniques. Limited vegetative treatments such as mechanical, biological, chemical and	Same as alternative A, plus: Work with the local power line company to retain native shrubland community in the transportation corridors through the Sunkhaze Meadows Unit.	Same as alternative B, plus: Convert 55 acres of existing conifer forest and 660 acres of existing northern hardwood-mixed forest to early successional shrubland habitat.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
	prescribed fire, where appropriate, to manage desirable vegetation and to control invasive plants. Refine objectives as needed with new information and the revised cover type mapping.	Allow natural disturbances and processes to create a continuum of successional age conditions, including a component of grassland, shrubland, and young forest habitats.	Regularly conduct treatment harvests would be conducted every 15 years. Stands dominated by hardwood and alder components would be selected to take advantage of access routes established so as not to create any new roads or skid trails, as well as taking advantage of established log yards (barren habitat type). Conduct migratory and breeding bird surveys to detect presence/absence and long-term trends. Focus on priority species.
Goal 2: Promote the environmental health of forest, open water, and emergent wetland habitat at Carlton Pond WPA to benefit waterfowl and sustain a diversity of wildlife including species of conservation concern.			
Objective 2.1 Carlton Pond: Open Water – Emergent Marsh			
	Manage the combined 783 acres of open water (295 acres) and emergent marsh (455 acres) habitat, and the 34 acres of treed peat bog on the Carlton Pond WPA to maintain appropriate water levels and provide emergent wetlands.	Same as alternative A.	Same as alternative A.
Strategies to Achieve Objective 2.1	Continue to manage the Carlton Pond impoundment for a stable water level, particularly during the black tern incubation period from May 25 through July 15. Continue to maintain water control structure and spillway.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Initiate aquatic invasive species prevention through monitoring, EDRR, and public outreach. <u>Over the life of the plan:</u> Work with neighbors and partners to protect streams and riparian areas within the Carlton Pond watershed on maintaining sufficient buffer to prevent runoff of sediments and pollutants into Carlton Pond.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		Explore protection of some parcels adjacent to Carlton Pond. Explore the establishment of a waterfowl banding program in collaboration with other partners.	
Objective 2.2 Carlton Pond: Conifer and Northern Hardwood- Mixed Forest			
	Preserve the 45 acres of conifer forest and 239 acres of northern hardwood-mixed forest on the Carlton Pond WPA.	Same as alternative A.	Same as alternative A.
Strategies to Achieve Objective 2.2	Continue to not provide any management.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Conduct invasive species inventory and monitoring to prevent new invasions. Remove any duck boxes that are in disrepair and over time remove remaining artificial nest boxes <u>Over the life of the plan:</u> Work with neighbors and partners to protect forested areas within the Carlton Pond watershed. Explore acquisition of some parcels adjacent to Carlton Pond.	Same as alternative B, plus: <u>Over the life of the plan:</u> Conduct a forest health and condition assessment, as well as stand exams, to determine the current condition of the forest and its species. Explore partnership opportunities to inventory use of forested habitat by migrating priority birds.
Goal 3: Promote the environmental health of forest, grassland, and shrubland habitat at Benton and Sandy Stream Units to sustain a diversity of wildlife, including species of conservation concern.			
Objective 3.1 Benton Unit: Grassland Habitat			
	Manage 95 acres on the Benton Unit	Manage at least 92 acres on the Benton	Allow the remaining 92 acres of grassland to

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
	as grassland habitat.	Unit as grassland, including the potential conversion of an additional 22 acres of conifer forest to grassland.	convert to native shrubland habitat.
Strategies to Achieve Objective 3.1	Annually mow 75 acres of existing grasslands through a special use permit. Use prescribed burning to maintain remaining 20 acres of existing grassland.	<u>Over the life of the plan:</u> Annually mow 72 acres of the existing grasslands after July 15th through a special use permit to maintain the habitat and protect ground nesting birds. Allow the 3 acres of grassland in the northern property boundary to transition into mature forest. Use prescribed burning as resources are available, to maintain 20 acres of existing grassland, which is too rocky to mow. Conduct invasive species inventory and monitoring. If feasible, convert 22 acres of forest to grassland and maintain as grassland.	<u>Within 5 years of CCP approval:</u> Allow the 3 acres in the northern property boundary to convert to forest. Cease annual mowing and allow the existing 92 acres of grassland to convert to native shrubland habitat. Conduct migratory and breeding bird surveys to detect presence/absence and long-term trends. Focus on priority species. <u>Over the life of the plan:</u> Mow woody growth every 10 years or as needed to maintain target vegetation characteristics and to control invasive plants.
Objective 3.2 Benton Unit: Sedge Meadow, Open Marsh, and Riparian Habitats			
	Maintain 13 acres of sedge meadow and the included 2.4 acres of emergent marsh-open water at the Benton Unit.	Maintain 13 acres of sedge meadow and the included 2.4 acres of emergent marsh-open water dominated at the Benton Unit to sustain freshwater wetlands.	Same as alternative B.
Strategies to Achieve Objective 3.2	Continue to maintain cooperative farming as a grassland management tool in portions of the Benton Unit surrounding sedge meadow and marsh habitats.	<u>Within 5 years of CCP approval:</u> Evaluate the mowing regime around sedge meadow and freshwater wetlands to enhance wetland conditions. Explore partnership opportunities to inventory use of habitat by reptiles, amphibians, and priority birds of	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		conservation concern. Continue to allow natural process to maintain the sedge meadow habitat.	
Objective 3.3 Benton Unit: Mixed Conifer-Hardwood Forest			
	Preserve the 155 acres of northern hardwood mixed forest and 71 acres of conifer forest on the Benton Unit.	Manage 155 acres of northern hardwood mixed forest and 52 acres of conifer forest on the Benton Unit.	Manage 155 acres of mixed hardwood forest and 74 acres of conifer forest on the Benton Unit to promote self-sustaining, mature Atlantic northern forests.
Strategies to Achieve Objective 3.3	Continue to not provide any ongoing management.	Over the life of the plan: Allow the 3 acres in the northern property boundary to convert to forest. Conduct a forest health and condition assessment, as well as stand exams, to determine the current condition of the forest. Explore partnership opportunities to inventory the use of habitat by reptiles, amphibians, and priority birds of conservation concern.	Same as alternative B.
Objective 3.4 Sandy Stream Unit: Shrubland Habitat			
	Manage 39 acres on the Sandy Stream Unit as early successional shrubland habitat.	Manage 37 acres of shrubland habitat on the Sandy Stream Unit.	Same as alternative B.
Strategies to Achieve Objective 3.4	Use vegetative treatments such as burning and cutting every 10 years, to manage desirable vegetation and to control invasive plants.	Within 5 years of CCP approval: Relocate the snowmobile trail adjacent to Prairie Road to provide a more contiguous habitat unit. Work with the snowmobile club to coordinate snowmobile trail maintenance.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		Over the life of the plan: Maintain 37 acres of shrubland habitat and help control invasive plants by burning or mowing every 10 years, or as needed	
Objective 3.5 Sandy Stream Riparian Habitat			
	Maintain the existing 25-foot forested riparian buffer along Sandy Stream.	Expand the existing forested riparian buffer to at least 90 feet along Sandy Stream.	Same as alternative B.
Strategies to Achieve Objective 3.5	Maintain the existing forested buffer along Sandy Stream at its minimum width of 25 feet.	Expand the buffer along Sandy Stream to 90 feet by ceasing mowing and allowing natural succession to develop a mature riparian forest.	Same as alternative B, except: Plant select native trees typical of riparian forests (considering potential changes in climate) within the expanded forested buffer along Sandy Stream to a minimum of 90 feet.
Goal 4: Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, wildlife, and cultural resources of the Sunkhaze Meadows Unit.			
Objective 4.1 Wildlife Observation and Photography – Sunkhaze Meadows Unit			
	Provide visitors with existing opportunities for wildlife observation and photography along six walking trails and the ITS snowmobile trail at the Sunkhaze Meadows Unit.	Provide visitors with opportunities for wildlife observation and photography along four existing walking trails, a new trail, the ITS snowmobile trail (in winter), and a developed boat access at the Sunkhaze Meadows Unit.	Provide visitors with opportunities for wildlife observation and photography along six existing walking trails, a new trail, the ITS snowmobile trail (in winter), and a developed boat access at the Sunkhaze Meadows Unit.
Strategies to Achieve Objective 4.1	Provide minimal maintenance of existing trail system. Continue to maintain existing snowmobile trails at the Sunkhaze Meadows Unit.	Within 5 years of CCP approval: Improve refuge Web site to encourage visitation. Develop a new trail near Carter Meadow . Develop two additional gravel parking	Same as alternative B, plus: Within 5 years of CCP approval: Explore partnership with the Friends to provide an organized canoe tour of Sunkhaze Stream.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
		lots: one each near the Carter Meadow and Oak Point trailheads. Close two Buzzy Brook trails due to maintenance difficulty. <u>Over the life of the plan:</u> Maintain access along four trails (Johnson Brook, Carter Meadow, Ash Landing, and Oak Point) and along the 3.2 mile long McLaughlin Road. Continue to allow snowmobile clubs to maintain nearly 2 miles of existing snowmobiling trails under special use permits at Sunkhaze Meadows (ITS 84). Improve directional trail signs to better access and identify trailheads. Replace boardwalks and eliminate a spur trail along Johnson Brook Trail. Expand wildlife observation opportunities by exploring the potential for commercial guided canoe and kayak trips along Sunkhaze Stream. Work with willing landowners to establish boat access on lands and waters near or adjacent to the refuge.	Improve refuge Web site to encourage visitation by adding trail maps, bird lists, and recent observations. <u>Over the life of the plan:</u> Maintain access along six trails (Buzzy Brook North, Buzzy Brook South, Johnson Brook, Carter Meadow, Ash Landing, and Oak Point) and along the 3.2 mile long McLaughlin Road including the repair and maintenance. Develop a new trail near Carter Meadow as well as two gravel parking lots: one each near the Carter Meadow and Oak Point Trail heads. Continue to allow snowmobile clubs to maintain existing snowmobiling trails under special use permits at Sunkhaze Meadows (ITS 84). Install an observation deck along the Oak Point Trail overlooking the peat bog.
Objective 4.2 Hunting			
	Annually provide visitors access to numerous hunting opportunities at Sunkhaze Meadows Unit.	Annually provide visitors hunting opportunities for big game, upland game and migratory game birds at Sunkhaze Meadows Unit.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
Strategies to Achieve Objective 4.2	Continue to offer hunting opportunities in accordance with State regulations except for a shorter coyote season.	Same as alternative A, plus: Within 1 year of CCP approval, update the refuge Web site with current, refuge-specific hunting regulations.	Same as alternative B, except: <u>Within 5 years of CCP approval:</u> Expand coyote hunting by one month to extend the spring season up until April 30th on all units. Initiate monitoring protocols for potential adverse impacts on the refuge's wildlife as a result of the expanded hunting season.
Objective 4.3 Fishing			
	Annually provide anglers with access to fishing opportunities at Sunkhaze Stream and in tributaries at Sunkhaze Meadows Unit.	Annually provide anglers with access to fishing opportunities at Sunkhaze Stream and its tributaries at Sunkhaze Meadows Unit.	Same as alternative B.
Strategies to Achieve Objective 4.3	Continue to offer fishing opportunities and access on refuge lands. Continue to allow motor boat access to Sunkhaze Stream.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Improve signs, brochures, and the Web site related to fishing opportunities on the refuge. <u>Over the life of the plan:</u> Expand fishing opportunities by exploring commercial guided services along Sunkhaze Stream. Explore development of improved access near the mouth of Sunkhaze Stream and other areas (e.g. Ash Landing, partnership with neighboring land owner).	Same as alternative B, plus: Within 5 years of CCP approval, collaborate with partners to sponsor one or more youth fishing events off the refuge.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
Objective 4.4 Environmental Education and Interpretation			
	Provide visitors with access opportunities for environmental education and interpretation.	Improve environmental education and interpretation at the refuge by developing and implementing Service-led environmental education programs, providing additional support to existing, volunteer-led programs (i.e. Friends of Sunkhaze Meadows), and working with new partners.	Same as alternative B.
Strategies to Achieve Objective 4.4	Allow local high school and college instructors to access Sunkhaze Meadows Unit for environmental education purposes. Rely on the Friends of Sunkhaze Meadows NWR to promote and conduct one environmental interpretive program each month. Allow partners to conduct education and interpretive programs on refuge lands upon request.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Work with the town of Milford, the Penobscot Nation, and other partners to develop regional cultural and eco-tourism and increase refuge visitation. Update the existing signs on the unit, develop at least one additional interpretive display, and update existing general brochure. Develop relationships with at least two local schools to provide at least one environmental education program or teacher training each year. <u>Over the life of the plan:</u> Refuge staff would conduct four interpretive programs each month across all refuge units and Carlton Pond WPA. Work with the Penobscot Nation to develop interpretive materials (brochures, signs, Web site) to educate the public about the refuge's cultural resources.	Same as alternative B, plus: Over the life of the plan, develop and promote a woodcock management demonstration area at Sunkhaze Meadows Unit.

	Alternative A **Current Management**	**Alternative B** **Service-Preferred Alternative**	**Alternative C** **Intensive Management and Increased Public Use and Facilities**
Goal 5: ***Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the wetlands, woods, and wildlife at Carlton Pond WPA.***			
Objective 5.1 Public Use: Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation			
	Allow visitors at Carlton Pond WPA to participate in wildlife observation and photography, hunting, and fishing to create opportunities for connecting visitors with nature.	Same as alternative A.	Same as alternative A.
Strategies to Achieve Objective 5.1	Continue to allow motor boat access to Carlton Pond. Annually provide visitors with access to waterfowl hunting and furbearer management at Carlton Pond WPA. Offer coyote hunting during a season modified from the State season. Allow two field trial events at Carlton Pond WPA as authorized under a special use permit.	Same as alternative A, plus: <u>Within 5 years of CCP approval:</u> Develop relationships with local schools to provide environmental education programs and teacher training. Develop partnerships to promote environmental education, interpretation, and public use at Carlton Pond WPA. <u>Over the life of the plan:</u> Maintain and update as needed existing signs and develop at least one brochure for Carlton Pond WPA. Refuge staff would conduct four interpretive programs each month at Carlton Pond WPA. Reduce the number of wood duck nesting boxes maintained for interpretive purposes.	Same as alternative B, except: Over the life of the plan, expand coyote hunting by one month to extend through April 30th to coincide with other refuge lands.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
Goal 6: Engage visitors, students, and nearby residents in the Refuge System's six priority public uses, as well as other compatible public uses, to enhance public understanding, enjoyment, and environmental stewardship of the shrublands, woods, grasslands, and wildlife at the Benton and Sandy Stream Units.			
Objective 6.1 Public Use: Wildlife Observation and Photography, Hunting, Fishing, Environmental Education and Interpretation			
	Continue to provide visitors with access opportunities for wildlife observation and photography, hunting, and fishing at the Benton and Sandy Stream Units.	Same as alternative A.	Same as alternative A.
Strategies to Achieve Objective 6.1	Continue minimal maintenance of existing trail system. Partner with local snowmobile clubs that maintain existing snowmobile trails under special use permits at the Benton and Sandy Stream Units to maintain snowmobile trails on Service-owned lands.	<u>Over the life of the plan:</u> Collaborate with snowmobile clubs to relocate the snowmobile trail on the Sandy Stream Unit closer to the road. Develop partnerships to promote environmental education, interpretation, and public use at the Benton and Sandy Stream Units. Create a 0.25-mile long connector trail between the parking lot and existing snowmobile trail at the Benton Unit.	Same as alternative B, plus: <u>Over the life of the plan:</u> Provide a larger network of 3.4 miles of hiking trails at the Benton Unit. Initiate monitoring protocols for potential adverse impacts on the refuge's wildlife as a result of the expanded hunting season.
Goal 7: Communicate and collaborate with local communities, Federal and State agencies, local and Tribal representatives, and other organizations throughout Maine and the region to further the purposes of the refuge and the mission of the National Wildlife Refuge System.			
Objective 7.1 Refuge Friends Group			
	Continue to support regular interpretive programming and events sponsored by the Friends of Sunkhaze Meadows NWR at the Sunkhaze Meadows Unit through access, facilities maintenance, and staff involvement.	Same as alternative A.	Same as alternative A.
Strategies to Achieve Objective 7.1	Work with the Friends to maintain trails and control invasive plant species.	<u>Over the life of the plan:</u> Increase support for the Friends organization by organizing volunteer activities and developing special projects.	Same as alternative B.

	Alternative A Current Management	Alternative B Service-Preferred Alternative	Alternative C Intensive Management and Increased Public Use and Facilities
	Maintain links to the Friends' Web site from the refuge's Web site.	Support the long-term sustainability of the Friends organization through training programs, as well as assistance with obtaining capacity building grants.	
Objective 7.2 Agency, Tribal, Academic, and Other Partnerships			
	As opportunities arise, work with State agencies, Tribal partners, and universities to support interpretive programs and research projects at Sunkhaze Meadows NWR and Carlton Pond WPA.	Same as alternative A.	Same as alternative A.
Strategies to Achieve Objective 7.2	Continue to coordinate and maintain partnership opportunities as they arise.	Over the life of the plan: Work with the Penobscot Indian Nation to explore opportunities for developing materials and programming interpreting cultural resources on the refuge. Explore partnerships for assistance in managing and interpreting the Benton and Sandy Stream Units, Carlton Pond WPA, and conservation within the watershed. Explore partnerships to promote the Sunkhaze Meadows Unit as part of local and regional tourism. Establish an annual coordination meeting among Maine refuges and Tribes to collaborate on natural resource and public use management. Work with partners to ensure consistent refuge and Refuge System messaging in partner-sponsored environmental education and interpretive programming.	Same as alternative B.

Chapter 4

USFWS

Eastern elliptio mussel.

Environmental Consequences

- **Introduction**
- **Impacts on Air Quality**
- **Impacts on Hydrology and Water Quality**
- **Impacts on Soils**
- **Impacts on Vegetation**
- **Impacts on Migratory Birds**
- **Impacts on Fisheries and Mussels**
- **Impacts on Mammals**
- **Impacts on Other Native Wildlife (Amphibians, Reptiles, and Invertebrates)**
- **Impacts on Threatened and Endangered Species**
- **Impacts on Public Use and Access**
- **Impacts to the Socioeconomic Environment**
- **Impacts on Cultural and Historic Resources**
- **Cumulative Impacts**
- **Summary of Environmental Consequences by Alternative**

Introduction

This chapter describes the environmental consequences we predict from implementing the refuge management alternatives presented in chapter 3. Where detailed information is available, we present a scientific and analytic comparison between alternatives and their anticipated consequences, which we describe as “impacts” or “effects.” In the absence of detailed information, we make comparisons based on our best professional judgment and experience.

We focus our discussion on the impacts associated with the goals and key issues identified in chapter 1, “Purpose of, and Need for, Action.” Direct, indirect, short-term, beneficial, and adverse effects likely to occur over the 15-year life span of the plan are discussed. Beyond the 15-year planning horizon, we give a more speculative description of the direct, indirect, and cumulative effects. The chapter identifies cumulative impacts, any irreversible and irretrievable commitment of resources, and the relationship between short-term uses of the environment and its long-term productivity. At the end of this chapter, table 4.2 summarizes the effects predicted for each alternative and allows for a side-by-side comparison.

Regional, Historical, and Watershed Context

As required by the CEQ and Service regulations implementing NEPA, we assessed the importance of the effects of the alternatives presented in the draft CCP and EA based on their context and intensity. The context of the impacts ranges from site-specific to broader regional and ecoregional scales (table 4.1). Although refuge lands comprise a small percentage of these larger regional area contexts, all alternatives were developed to contribute towards conservation goals in these larger contexts. For each alternative, we based our evaluation of the intensity of the effects on the following factors:

- The expected degree or percent of change in the resource from current conditions.
- The frequency and duration of the effect during the 15-year planning horizon.
- The sensitivity of the resource to such an effect or its natural resiliency to recover from such an effect.
- The potential for implementing effective preventive or mitigating measures to lessen the effect.

Table 4.1. Existing Context for Impacts Analyses at Sunkhaze Meadows NWR and Carlton Pond WPA.

Sunkhaze Meadows Unit

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Penobscot River Watershed	5.5 million acres (8,610 square miles)
Town of Milford, Penobscot County (Sunkhaze Meadows Unit)	29,300 acres (45.8 square miles)
Sunkhaze Meadows Unit	11,484 acres (17.9 square miles)

Benton Unit

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Sebasticook River Watershed	606,000 acres (947 square miles)
Town of Benton, Kennebec County (Benton Unit)	18,200 acres (28.4 square miles)
Benton Unit	334 acres (0.5 square miles)

Sandy Stream Unit

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Sebasticook River Watershed	606,000 acres (947 square miles)
Town of Unity, Waldo County (Sandy Stream Unit)	26,800 acres (41.8 square miles)
Sandy Stream Unit	58 acres (0.1 square miles)

Carlton Pond WPA

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Sebasticook River Watershed	606,000 acres (947 square miles)
Town of Troy, Waldo County (Carlton Pond WPA)	22,400 acres (35 square miles)
Carlton Pond WPA	1,068 acres (1.7 square miles)

Management Actions Not Analyzed in Detail

The following list of management activities are not analyzed in detail in this document because they are both trivial in effect and common to all alternatives. These would qualify for categorical exclusion under applicable regulations if independently proposed:

1. Operations and maintenance of existing infrastructure and facilities (unless major renovation is involved).
2. Issuance of new or revised management plans when only minor changes are planned.
3. Law enforcement activities.
4. Nondestructive research, resource inventories, and other resource information collection activities.
5. Routine, recurring management activities and improvements, including managing invasive plants.
6. Small construction projects (for example, fences, berms, small stream and wetland restoration projects, trail maintenance, interpretative kiosks, and development of access for routine management purposes).
7. Minor vegetation plantings.
8. Reintroducing native plants and animals.
9. Minor changes in amounts or types of public use.

“Extraordinary circumstances” as described in 43 CFR 46.215 are exceptions to our categorical exclusions. If any of these exceptions apply, we will conduct further NEPA analysis of the proposed action. Where possible and information is available, we provide discussions of how the below management actions could beneficially or adversely impact refuge resources.

Actions that may require additional NEPA analysis beyond this draft CCP and EA are changes to the hunt program proposed under alternative C and construction or renovation of facilities to accommodate additional staff proposed in alternatives B and C. We will conduct further NEPA analysis on these actions in the future, if needed.

Our analysis first focuses on broad, regional-scale impacts, then examines more refuge-specific impacts. The chapter is organized as follows:

Regional-scale Impacts:

- Air quality
- Hydrologic systems and water quality
- Socioeconomic resources

Refuge-specific Impacts:

- Soils
- Vegetation
- Migratory birds
- Fish
- Mammals
- Other native wildlife (reptiles, amphibians, and invertebrates)
- Threatened and endangered species
- Public use
- Cultural and historic resources

Under each heading we discuss the resource context, benefits, and adverse impacts of management actions that would occur regardless of which alternative is selected, and finally the benefits and adverse impacts of each of the alternatives. We examine the impacts of current and proposed administrative or general operations, habitat management, visitor services, and public uses on each of the physical, biological, and cultural resources noted above.

We end the chapter with discussions on:

- Cumulative impacts.
- The relationship between short-term uses of the human environment and enhancement of long-term productivity.
- Unavoidable adverse effects.
- Potential irreversible and irretrievable commitments of resources.
- Environmental justice

Impacts on Air Quality

Chapter 2, “Affected Environment,” discusses the status of air quality in the landscape around the refuge and WPA. For the purposes of this draft CCP and EA, we did not estimate the relative amounts of potential air pollutants that would be emitted under each alternative. However, we believe that the impacts of refuge management on air quality would not vary significantly under any of the alternatives. Hence, the discussion of beneficial and adverse effects on air quality has been combined in this section. We predict that refuge land management, regardless of the alternative, would have a net positive effect on air quality. Maintaining vegetative cover, improving energy efficiencies, and limiting public uses to those that are appropriate, compatible, and wildlife-dependent would collectively help reduce any air quality impacts.

We evaluated the management actions the alternatives propose for their potential to improve air quality locally, throughout the region, and globally.
The benefits we considered include:

- Air filtering and carbon sequestration resulting from long-term land protection and conservation.
- The potential of habitat management practices, such as habitat conversion, to contribute to carbon sequestration and reduce greenhouse gases.

The potential adverse effects of the management alternatives we evaluated include:

- Emissions from vehicles or equipment.
- Public uses, including snowmobiling.
- Particulates from burning prescribed fires as a management tool.
- Accumulation of dust and air-borne particulate matter during construction and renovation.

Regardless of which management alternative we select, refuge management activities should not adversely impact regional air quality. None of the alternatives would violate EPA standards and all three would be in compliance with the Clean Air Act.

Impacts on Air Quality That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—Long-term benefits for air filtering and carbon sequestration would result from the ongoing land protection encompassed by the refuge and WPA. The long-term growth of vegetation, and their interaction with the soils they grow in, can sequester atmospheric carbon, thereby providing a small reduction in the greenhouse gas.

Impacts from Public Uses—For all three alternatives, any human caused sources of emissions from refuge activities and visitor vehicles would be negligible compared to emissions associated with the various land uses in the Bangor and Milford-Orono region and adjacent highways surrounding Sunkhaze Meadows Unit, as well as the Waterville-Unity region surrounding the Benton Unit, Sandy Stream Unit, and Carlton Pond WPA. No major stationary or mobile sources of air pollution are present on Service-owned lands, and none would any be created under any of the alternatives. None of the alternatives are expected to exceed Federal Clean Air Act air quality standards and no Class I air quality areas would be affected.

Adverse Impacts

Land Protection and Habitat Management—Under all alternatives, implementing our habitat management strategies involves the use of vehicles, equipment, and power tools that result in carbon emissions at the various refuge units and the WPA. However, the use of these tools and machinery are minimal and infrequent compared to the surrounding land use.

Prescribed burning would continue to be a valuable habitat management tool, under all alternatives. Effects of the refuge's fire management plan were analyzed in a previous NEPA process completed in 2002 (USFWS 2002). With fire, the pollutant of primary concern is particulate matter. Particulates can reduce visibility or cause negative effects on the health of people with respiratory illnesses. Appropriate smoke management can minimize or nearly eliminate both of these negative effects. To mitigate adverse impacts to air quality and human

health, prescribed fire burn plans analyze smoke sensitive groups and locations such as schools, nursing homes, and hospitals and take into consideration wind speed, direction, and mixing heights to channel smoke (water vapor and particulates) away from populated areas, and ability to lift smoke as quickly as possible for maximum dispersal and dilution.

In planning our prescribed burns, we would consider all those factors, and other environmental and geographical factors, as detailed in the refuge's fire management plan (USFWS 2002). An approved prescribed fire plan (also called a "burn plan") must be written for each prescribed fire project on Service property. A burn plan outlines our management objectives, prescription, resources to be used, contingencies, and mitigation required for the prescribed fire. Smoke management guidelines from the EPA (Clean Air Act standards) and State air quality regulations for prescribed burning are used to develop parameters for burning and are an agency requirement. Our burn plans specify no burning when poor atmospheric conditions are forecasted, and we use smoke dispersion and air quality information generated by the National Weather Service. We are required to obtain a "Spot Weather Forecast" prior to implementing any prescribed burn.

We understand that fires (both prescribed burns and wildfires) affect air quality and consequently may affect area residents. Because of these potential impacts to the airshed, we limit the size of our burn units for prescribed fires. Impacts on a regional level would also be minimized from burns at Benton and Sandy Stream Units by having small units that can be treated (burned) in a short period of time. Based on our experience, and as described in the fire management plan, we expect prescribed burning would not have noticeable, long-term negative impacts to air quality.

As highlighted throughout this summary, our management actions at the refuge and WPA are infrequent and of such small-scale that they are expected to have minimal impact on refuge and regional air quality.

Impacts from Public Uses—Sunkhaze Meadows Unit, Benton Unit, and Sandy Stream Unit all contain portions of regional or local snowmobile trails. Sunkhaze Meadows Unit contains a portion of the State of Maine ITS network: an extensive snowmobile trail network that connects Maine to neighboring states and Canada. This is an historical and an existing use of the refuge, and only small portions of the trails cross refuge lands. Additional outreach activities under alternatives B or C could result in a minor increase in snowmobile use and associated emissions on refuge trails. We believe that levels of snowmobile use have been fairly constant over the last 10 years or so and we do not intend to target snowmobile groups for outreach activities; therefore, we expect any change in snowmobile use and associated emissions would be negligible.

Similar to our land management activities, our visitation to the refuge and WPA are of such small-scale with only slight increases projected across all alternatives. They are expected to have minimal impact on refuge and regional air quality.

Impacts on Air Quality Under Alternative A (Current Management)

In addition to *Impacts on Air Quality That Would Not Vary by Alternative*:

Benefits

Land Protection and Habitat Management—Continued management of refuge and WPA land are expected to help reduce any future direct and cumulative air quality impacts. Maintaining natural vegetative cover on up to 11,876 acres at all three units of Sunkhaze Meadows NWR and 1,068 acres at Carlton Pond WPA would continue to provide long-term air filtering and carbon sequestration benefits. Public uses would be limited only to those activities that are appropriate, compatible, and wildlife-oriented. Collectively, these management actions would help reduce the potential for additional human-caused sources of emissions in the surrounding landscape.

Trees have been shown to reduce the concentration of ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter less than 10 and 2.5 microns in diameter, primarily through direct uptake and adhesion to stems and leaves (Escobedo et al. 2007). With respect to greenhouse gases responsible for climate change, plants absorb carbon dioxide and as a result, vegetated areas can act as an important carbon sink (Heath and Smith 2004). This “carbon sequestration” is essentially the process by which plants take up carbon dioxide through photosynthesis, after which it is stored in plant biomass (wood) and in the soil. Generally, succession to forest stores the most carbon, and the rate of sequestration declines as trees mature (Heath and Smith 2004).

Impacts from Public Uses—Alternative A would continue to include minimal trail maintenance, periodic updating and replacing of refuge signs, and habitat management that would continue to contribute negligibly to regional emissions. We expect no change over current, baseline levels of emissions under this alternative.

Adverse Impacts

Land Protection and Habitat Management—Under all alternatives we would continue to use mowing and prescribed burning, if deemed appropriate, at the Benton Unit and Sandy Stream Unit. Grasslands can function as carbon sinks if plant biomass is converted to soil (Buyanovsky and Wagner 1998). Mowing vegetation and prescribed burning can also lead to a temporary and localized suspension of particulate matter. However, the limited extent of these activities occurring under current refuge management is of negligible impact on local air quality.

Impacts from Public Uses—The regional vehicle emissions resulting from the approximately 6,300 visitors to Service-owned lands and WPA lands would continue to be negligible in comparison to ambient air quality and emission from the surrounding region.

Impacts on Air Quality Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—Long-term benefits for air filtering and carbon sequestration from land protection and management would be similar to those in alternative A. In addition, the conversion of 3 acres of grassland to forest at the Benton Unit and 2 acres of

shrubland to riparian forest at the Sandy Stream Unit would have a small benefit to air quality by reducing the overall need for mowing to maintain grassland and shrubland habitat.

Adverse Impacts

Land Protection and Habitat Management—At Sunkhaze Meadows Unit and Benton Unit, land management and construction activities related to increasing habitat management and expanding visitor service infrastructure would cause short-term, localized air quality effects from construction vehicles and equipment. Vehicles and motorized equipment release several air pollutants. However, the frequency and intensity vehicles and machinery are anticipated to remain relatively low.

Under this alternative, the potential conversion of up to 22 acres of conifer forest to grassland at the Benton Unit would add more minor impacts to air quality due to the forest clearing and then subsequent prescribed burning and mowing required to maintain the area as grassland. Minor changes in burn program are within the limits presented in the fire management plan. Minor changes in mowing may have negligible effects.

Impacts from Public Uses—Across all refuge units and the WPA, expanding refuge programs and outreach efforts, and improving facilities and exhibits, is expected to slightly increase visitation over the 15-year period of the plan. A marginal increase in local vehicle emissions would result from the increase in visitation, but it would be negligible in comparison to ambient air quality and emissions from land uses surrounding Service-owned lands and nearby Interstate 95.

Impacts on Air Quality Under Alternative C

The benefits and impacts to air quality under alternative C are the same as those previously described under alternative B, except:

Benefits

Land Protection and Habitat Management—The conversion of 3 acres of grassland to forest at the Benton Unit and 2 acres of shrubland to riparian forest at Sandy Stream Unit would have a small benefit to air quality by reducing the overall need for mowing to maintain grassland and shrubland habitat.

Adverse Impacts

Land Protection and Habitat Management—At the Sunkhaze Meadows Unit, the conversion of 715 acres of northern hardwood mixed forest and conifer forest to young forest early successional habitats would result in extensive use of machinery and vehicles. In evaluating the impacts of this conversion, we did not quantify exact levels of emissions. However, we do understand that a conversion of this size has air emission impacts related to the use of equipment and machinery. Heavy equipment would be necessary to conduct tree harvesting and land clearing needed for removing mature forest cover and allowing shrub and sapling growth desired under this alternative; however, this conversion would occur over 45 years. Central Maine (including lands surrounding the Sunkhaze Meadows Unit) contains an extensive commercial logging industry. According to the Maine Forest Service, nearly 500,000 acres of Maine’s forests

are logged each year (MFS 2012). By comparison, the clearing of 715 acres at Sunkhaze Meadows Unit would equate to 0.1 percent of this annual total. As such, the overall impact to air quality relative to the broader landscape of Maine would be negligible.

Impacts from Public Uses—Visitation is expected to increase slightly more under alternative C when compared to alternative B. However, the overall frequency and intensity vehicles and machinery would still remain relatively low.

Short-term impacts from vehicle and machinery emissions would be greater when compared to alternative B. Additional trail creation and ongoing maintenance at both Sunkhaze Meadows Unit and Benton Unit would result in increased use of chainsaws, vehicles, and machinery. New trail creation at both of these outlined in alternative C would result in a combined total of 5 miles of additional trails. Despite that increase in clearing, maintenance, and access associated with these trails, the overall increase in emissions is still considered negligible when compared to other regional sources.

Impacts on Hydrology and Water Quality

As discussed in chapter 2, the refuge and WPA include numerous waterways and other open waters. Management alternatives proposed for the refuge and WPA were evaluated and compared based on their potential to help maintain and improve the hydrology and water quality of the streams, ponds, and impoundments found within the refuge and WPA.

We evaluated the benefits of the following actions that would protect or restore hydrology or maintain or improve water quality:

- Land protection and conservation that would provide watershed benefits by limiting land clearing and changes in local hydrology.
- Habitat management activities and projects that would improve water quality.
- Maintaining the existing water control structure at Carlton Pond WPA.
- Improved cooperation with partners to influence water quality.

We evaluated the effects of the following actions with the potential to cause adverse effects on hydrology and water quality:

- Use of herbicides to manage invasive species.
- Habitat management activities and projects and temporary vegetation removal.
- Constructing visitor services facilities and infrastructure.
- Recreational use that may lead to increased erosion or siltation.

All three alternatives would comply with the Clean Water Act.

Impacts on Hydrology and Water Quality That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—Conservation and protection of natural vegetation and soils on all units of Sunkhaze Meadows NWR and Carlton Pond WPA would continue to

benefit water quality in the Penobscot River and Sebasticook River watersheds. Maintaining these resources limits development in those portions of each watershed and acts as a buffer against nonpoint source pollution in the surrounding landscape. The benefits of wetlands to water quality are well established, and include trapping, recycling, and exporting sediments, nutrients, organic materials, and contaminants (Carter 1996).

Under all alternatives, we would protect natural hydrology at Sunkhaze Meadows Unit, Benton Unit, and Sandy Stream and manage hydrology at Carlton Pond to benefit State-listed species.

We would continue to manage the water control structure at Carlton Pond WPA to maintain existing water levels within Carlton Pond itself.

Adverse Impacts

Land Protection and Habitat Management—None of the proposed management activities at the refuge or WPA under the three alternatives are expected to have long-term adverse effects to local or regional hydrology and water quality. None would violate Federal or State standards for contributing pollutants to water sources. None of the alternatives include new changes to refuge or WPA hydrology; therefore, no adverse impacts are expected on refuge or WPA hydrology.

Regardless of the alternative selected, we would continue to identify and control invasive plant species. We would use integrated pest management, which employs a variety of mechanical, biological, and chemical means of controlling invasive plants, but our experience to date suggests that the use of herbicides would continue to be part of our invasive species control program.

The risk that herbicides used on refuge and WPA uplands would reach wetlands is small. The level of review that Service policy requires before we can apply any chemical on refuge lands ensures that the environmental risk is minimized, and that all facets of the proposed use have been examined and justified. All products are used according to label instructions to minimize impacts on ground and surface waters. In addition, only herbicides specifically approved for aquatic application are used on or near refuge waters. When used appropriately, these products should not have direct or indirect negative impacts on water quality.

In managing the refuge and WPA, we would closely monitor and mitigate all of our routine activities that could result in chemical contamination of water directly through leakage or spills or indirectly through soil runoff. These include control of weeds and insects around structures, use of chemicals for deicing walkways and roads, and use of soaps and detergents for cleaning vehicles and equipment. Our personnel take precautions to minimize the potential for chemicals and petroleum products from becoming a water quality problem. As part of regular maintenance activities, some grease and cleaning chemicals could be washed off vehicles and equipment. This is not expected to impact water quality because we would use best management practices (e.g., ensure vehicles are cleaned away from refuge and WPA wetlands and nearby waters) to minimize potential impacts.

Impacts on Hydrology and Water Quality Under Alternative A (Current Management)

Benefits

Same as *Impacts on Hydrology and Water Quality That Would not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—Large scale land clearing, such as the annual mowing of the Benton Unit's grasslands, increases the potential for added runoff and soil erosion for a short time until vegetation reestablishes. By implementing BMPs, it would help us reduce the potential for specific short-term impacts resulting from these activities on all refuge units and the WPA.

Impacts from Public Uses—Current visitation to the refuge and WPA is small; nearly 6,300 visitors annually participate in some use on one of the refuge units or WPA. Most public uses, including wildlife observation, snowmobiling, photography, environmental education, and interpretation occur on established roads, boardwalks, trails, or other visitor facilities (e.g. observation platform). Some off trail public uses are authorized by the refuge manager including berry picking, hunting, cross-country skiing, and snowshoeing. In general, refuge visitation is low and most visitors choose to stay on established trails. Therefore, we expect only negligible adverse impacts to refuge and WPA water quality associated with public use.

Impacts on Hydrology and Water Quality Under Alternative B (Service-preferred Alternative)

Benefits

Benefits to hydrology and water quality under alternative B are similar to alternative A, except:

Land Protection and Habitat Management—Working with adjacent landowners to improve riparian buffer protection around Carlton Pond WPA, and working through partnerships with local land trusts to explore acquiring parcels or easements adjacent to Carlton Pond, would help protect and possibly improve water quality in Carlton Pond by preventing erosion and sedimentation into Carlton Pond itself.

Increasing the forested riparian buffer width at Sandy Stream Unit to a minimum of 90 feet would help improve water quality protection through additional shading and buffering effects from surrounding land use, public use, and our management actions.

Impacts from Public Uses—Improved access to Sunkhaze Stream would allow a greater number of visitors to experience waters on the refuge. In turn, our hope is that this opportunity and the experiences it provides would help to foster individual stewardship, which can ultimately help benefit water quality through expanded awareness of pollutant impacts and the reliance of fish, wildlife, and people on clean and healthy water.

If found to be suitable under the Wild and Scenic Rivers Act, rivers and streams can be classified as wild, scenic, or recreational. Generally, the classification of the river reflects the level of development at the time of designation, and future development levels must be compatible with such classification. We have tentatively classified the refuge's portion of Sunkhaze Stream and its tributaries as scenic, based on criteria in the Wild and Scenic River Act. This tentative classification allows for protective management purposes prior to a final suitability determination and/or congressional action. This ensures that river values and characteristics are protected (subject to agency policies and standards) until the evaluation process and possible designation is completed. If this stream section is found to be suitable and is eventually designated as a wild and scenic river, the designation would help protect the stream's hydrology and water quality by ensuring we protect its current natural condition. Designation also affords certain legal protection from adverse development, (e.g., no new dams may be constructed) nor would federally assisted water resource development projects be allowed that are judged to have an adverse effect on designated river values.

Adverse Impacts

Land Protection and Habitat Management—The potential conversion of 22 acres of forest to grassland at the Benton Unit could increase short-term potential impacts to water quality in Fowlers Brook compared to alternatives A and C. This area is adjacent to the small stream. If this area is cleared to expand grassland habitat, the cleared lands would be temporarily susceptible over the following 1 to 6 or possibly more months to surface runoff and erosion until sufficient vegetation establishes to provide long-term stabilization. These cleared lands would also require occasional clearing through prescribed burning or mowing, which has potential to cause similar disturbance.

Impacts from Public Uses—Under alternative B, there is greater potential for short-term, adverse effects on water quality associated with upgrading or new construction of trails, kiosks, and parking areas, and demolition of existing structures (cabins) on the Sunkhaze Meadows Unit when compared to alternative A. In all cases, best management practices would be followed to minimize any potential adverse effects. As discussed in the introduction to this chapter, additional NEPA analysis would be necessary for at least some of the larger projects proposed under this alternative (e.g., securing facilities for new refuge staff).

In comparison to alternative A, alternative B anticipates a modest increase in additional public use across all refuge units and the WPA. This increase would likely result from attracting new visitors through improved outreach and updated infrastructure, and expanding public use programs and opportunities. This could result in higher levels of vegetation trampling, soil disturbance, and erosion, potentially affecting water quality. However, we expect these impacts to be localized and of minimal. There are no anticipated long-term adverse impacts specific to this alternative.

A modest increase in boating would result in a corresponding potential for adverse water quality impacts. The current levels of pollutants from boat fuel and impacts on local aquatic systems are unknown. However, hydrocarbon contamination can be harmful to fish. Most boating is currently (and expected to remain) non-motorized, so we feel there is little contamination coming from this source. We would initiate public outreach and education on littering, pollutants, and

proper waste disposal if the use increases substantially above current use levels to help mitigate water quality impacts. There are no anticipated long-term adverse impacts specific to this alternative.

Impacts on Hydrology and Water Quality Under Alternative C

Benefits

Benefits to hydrology and water quality under alternative C are the same as alternative B.

Adverse Impacts

Land Protection and Habitat Management—The potential conversion of 715 acres of mature mixed hardwood and conifer forest to young forest at the Sunkhaze Meadows Unit could result in short-term potential impacts to water quality in Sunkhaze Stream or adjacent waters. If this acreage is cleared to expand young forest habitat, the cleared lands would be temporarily susceptible over the following 1 to 6 or possibly more months to increased surface runoff and erosion until sufficient vegetation establishes to provide long-term stabilization.

Impacts from Public Uses—Similar to alternative B, there is greater potential for short-term adverse effects on water quality associated with upgrading or new construction of trails, kiosks, and parking areas when compared to alternative A. In all cases, best management practices would be followed to minimize any potential adverse effects.

In comparison to alternatives A and B, alternative C anticipates a slightly greater increase in public use when compared to alternative B. This increase would likely result from improved outreach and expanding public use programs and opportunities. As noted under alternative B, this could result in higher levels of vegetation trampling, soil disturbance, and erosion, potentially affecting water quality. However, due to the current lack of disturbance resulting from visitation, we would expect these impacts to be localized and minimal.

Impacts on Soils

Soils are the structural matrix and nutrient source for plant productivity of habitats found on the refuge and WPA. Soils must be protected to sustain a variety of wetland, riparian, and upland habitats that help meet our habitat management goals. Overall, the soils on the refuge and WPA are productive and in good condition. They have little contamination and are able to support the diversity of habitats that would meet our biological management goals.

We evaluated and compared the management actions proposed for each of the alternatives based on their potential to benefit or adversely affect soils found on the refuge and WPA.

We compared the benefits of the alternatives from actions that would protect soils from erosion, compaction, or contamination or rather restore eroded, compacted, or contaminated soils, including:

- Long-term protection of refuge lands from development.

- Habitat management activities and projects that would improve soils protection, such as expanding riparian buffer areas.
- Visitor service infrastructure management that would reduce impacts to soils, such as trail closures and infrastructure improvements that minimize erosion and compaction.

The potential adverse soil effects of the refuge management alternatives that were evaluated included impacts from:

- Constructing visitor services facilities and infrastructure.
- Habitat management activities and projects, including vegetation removal and conversion, mowing and prescribed fire.
- Providing opportunities for authorized public uses (e.g., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).

Impacts on Soils That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—Healthy soils are critical to nutrient cycling and plant productivity on the refuge and must be protected to sustain the variety of wetland, riparian, and upland habitats. Overall, the soils of the refuge units and WPA are productive and in good condition, with no substantive erosion, compaction, or contamination problems. Regardless of which alternative is selected, we would continue to use best management practices in all management activities to maintain the health and productivity of refuge soils and to minimize erosion, compaction, and other impacts to soils.

Conversion from natural land cover to a developed use with impervious surfaces is considered to have the most severe impacts to soils due to disturbance of the natural soil structure and profile. Under all alternatives, we would strive for the greatest amount of natural cover and the least amount of impervious surface.

Under all three alternatives, the earthen dam at Carlton Pond WPA would be monitored and maintained to ensure public safety, to maintain the dam's function, and to prevent soil erosion that could lead to dam failure and subsequent downstream sedimentation. No designated trails or photo blinds exist or are proposed at Carlton Pond WPA under any of the alternatives; most visitors use canoes or kayaks to access the WPA, and opportunities for observation and photography occur on the adjacent road and access point as well as from a canoe, kayak or other boat on the water. Therefore, little to no adverse impacts to WPA soils is expected.

Impacts from Public Uses—Snowmobiling is allowed only on a few designated trails, maintained by local snowmobile clubs. Snowmobile clubs maintain all of the snowmobile trails under special use permits. They maintain about 6 miles of snowmobile trails: 4.6 miles at the Sunkhaze Meadows Unit, 1 mile at the Benton Unit, and 0.5 miles at the Sandy Stream Unit. Carlton Pond WPA does not contain any snowmobile trails. No new snowmobile trails are planned under any of the alternatives. Effects of moving the snowmobile trail at the Sandy Stream Unit is addressed under the discussion for effects under alternative B. Boardwalks that are in disrepair would be restored and small spur trails would be removed to protect the sensitive

wetland soils, as well as offering enhanced wildlife viewing opportunities under all three alternatives. Detailed discussion regarding the potential impacts of snowmobiles on soils can be found within the compatibility determination included for snowmobiling in appendix B.

Adverse Impacts

Land Protection and Habitat Management—Implementing habitat management strategies such as invasive species control may potentially result in localized compaction in areas where vehicles or excessive foot traffic are used in control efforts. Given the infrequent need for invasive species control, we believe that the low level and infrequent duration of these activities has little adverse impact on soil compaction or erosion.

Impacts from Public Uses—Public use activities have the potential to impact soils through trampling. Unauthorized uses, such as off-road vehicles or all-terrain vehicles, can indirectly affect soils by loosening surface layers and compressing underlying layers. Coupled with a loss of plant cover, the result can be increased soil erosion (Hammitt and Cole 1998). Trampling also decreases the abundance and diversity of soil organisms such as microbes, earthworms, arthropods, snails, and slugs, which often play a major role in nutrient cycling (Liddle 1997). At Sunkhaze Meadows NWR and Carlton Pond WPA off trail use is allowed for pedestrian access (on foot) for the purposes of wildlife observation, photography, berry picking, snowshoeing, cross-country skiing, fishing, and hunting. We believe that the low level of participation and infrequent duration of these activities has little adverse impact on soil compaction or erosion.

Under all alternatives, we would continue to enforce trail use regulations and non-authorized use of motorized vehicles (e.g., ATVs) and bicycles to prevent soil erosion and compaction. Off-road vehicles, such as motorbikes and all-terrain vehicles, which have the potential to cause severe erosion and rutting, are not allowed on the refuge. Bicycling is only allowed along McLaughlin Road.

Impacts on Soils Under Alternative A (Current Management)

Benefits

Land Protection and Habitat Management—Benefits resulting from land protection and habitat management activities are the same as found under *Impacts on Soils That Would Not Vary by Alternative*.

Impacts from Public Uses—With our estimated current visitation of around 6,300 visitors per year, we believe the combined visitation to all refuge units and the WPA is low where compared to other refuges in the region. Lower visitation benefits soils by minimizing risks of soil compaction or erosion associated with public use. Alternative A includes no expansion of the trail networks and no installation of new infrastructure or impervious surfaces that would cause additional soil compaction.

Adverse Impacts

Land Protection and Habitat Management—Impacts resulting from land protection and habitat management activities are the same as found under *Impacts on Soils That Would Not Vary by Alternative*.

Impacts from Public Uses—Under alternative A, we would continue to have limited ability to patrol public uses and access across all refuge units and the WPA. We would also have minimal opportunity to maintain and repair existing trails at the Sunkhaze Meadows Unit. Some of the trails pass through low-lying areas and wetlands, where boardwalks are in disrepair and side trails are evident. For trail maintenance, we would continue to rely on local volunteers, primarily the Friends of Sunkhaze Meadows NWR and local snowmobile clubs at the various refuge units. The lack of staff however, increases the likelihood of illegal activities (such as trail biking or ATV use) that could lead to soil erosion and disturbance. Alternative A is likely to result in the most severe impacts to soils, given our lack of ability to maintain trails and monitor public uses.

Impacts on Soils Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—Benefits resulting from land protection and habitat management activities are similar to those found under *Impacts on Soils That Would Not Vary by Alternative*.

In addition, under alternative B, the expansion of the forested riparian buffer along Sandy Stream from 25 feet to 90 feet by allowing natural re-growth of mature trees would provide more long-term protection against streambank erosion. Mowing equipment that is used to maintain the current shrub conditions would be kept out of the 90-foot riparian zone, thus reducing the potential impacts of soil compaction by mowing equipment.

Impacts from Public Uses—At the Sunkhaze Meadows Unit, the North and South Buzzy Brook Trails (3.0 miles and 2.4 miles, respectively) would be closed under alternative B. These two trails pass through forested wetlands, making them difficult to access and maintain. The closure of these two trails would benefit wetland soils by reducing access in an area that is readily susceptible to compaction.

Although there are no trails or parking access on Service land at Carlton Pond WPA, visitors can access Carlton Pond by canoe or other small boat. The increased presence of refuge staff under alternative B would provide for greater monitoring of public use at the Carlton Pond WPA, providing more protection to soil health compared to alternative A.

At Benton Unit, the proposed eventual increase of refuge staff under alternative B would allow greater monitoring and maintenance of the existing and proposed trails. This would provide greater protection to soil health compared to alternative A. Currently there is no specified public use trail leading from the existing gravel parking lot. As a result, refuge visitors must access the site by walking in any number of paths or directions. This expands the minimal potential for soil compaction and erosion resulting from public use. The proposed 0.25-mile trail would connect

the Benton Unit parking area to the snowmobile trail (which is open to other public uses when not suitable to snowmobiling). This action would concentrate and direct public use, thereby improving protection of soils in grassland and wetland areas.

The proposed eventual increase of refuge staff under alternative B would also provide for greater monitoring of public use at the Sandy Stream Unit. This would provide more protection to soil health as compared to alternative A. An existing snowmobile trail would be re-routed from the center of the property to along the outer edge of the shrubland habitat along Prairie Road. The existing trail corridor would then be allowed to grow back into shrub habitat. The trail currently passes through several low wet areas leading to minor soil erosion and rutting. The Service would work with the local snowmobile club to re-route the trail through drier terrain, minimizing soil compaction and rutting by avoiding wet areas, and thereby reducing the overall impact to soils at the Sandy Stream Unit. The increased presence of refuge staff under alternative B would provide for greater monitoring and maintenance of the rest of the existing trail network to ensure soil impacts are minimized.

Adverse Impacts

Land Protection and Habitat Management—Impacts resulting from land protection and habitat management activities are similar to those found under *Impacts on Soils That Would Not Vary by Alternative*.

Impacts from Public Uses—A modest increase in visitation anticipated under alternative B could result in minor increases in soil compaction and erosion. However, greater public use monitoring and trail maintenance under this alternative would likely alleviate or prevent potential problems from overuse or misuse of trails. We would close or restrict access if needed to protect sensitive areas. Boardwalks would be constructed over saturated areas to protect sensitive wetland soils. No construction other than placement of boardwalk pilings would be done in wetlands, so we anticipate only small, localized impacts to wetland soils.

At Sunkhaze Meadows Unit, newly proposed public use improvements including a new trail linking the proposed new Carter Meadow parking area and existing Carter Meadow trailhead would cause some one time, localized soil disturbance and compaction. The proposed Oak Point Trail parking area would impact an area approximately 35 feet by 55 feet in size. The Carter Meadow parking area would impact an area approximately 20 feet by 40 feet. Construction of these parking areas would require vegetation clearing and permanent soil disturbance through minor grading, excavation, placement of crushed gravel, and compaction.

We also anticipate little increased visitation at Carlton Pond WPA, and therefore no changes in adverse impacts are expected when compared to alternative A.

At Benton Unit, the proposed 0.25-mile trail would lead from the gravel parking lot to the existing snowmobile trail, which would create some additional soil compaction along the proposed trail corridor. However, the new trail would more effectively concentrate public use, protecting more sensitive areas of the Benton Unit and reducing the overall potential for soil disturbance. Increased visitation anticipated under alternative B could result in increased soil compaction and erosion along this new trail connection and the existing snowmobile trail.

However, greater monitoring of public uses and enhanced trail maintenance under this alternative would alleviate or prevent potential problems resulting from overuse or misuse of trails.

We anticipate little increased visitation at Sandy Stream and therefore no changes in adverse impacts are expected when compared to alternative A.

Impacts on Soils Under Alternative C

Benefits

Benefits to soils under alternative C are similar to alternative B.

Adverse Impacts

Land Protection and Habitat Management—Impacts resulting from land protection and habitat management activities are similar to those found under alternative B.

Impacts from Public Uses—At Sunkhaze Meadows Unit, North and South Buzzy Brook Trails would remain open under alternative C. Keeping these trails open, as well as their location across wet soils, would result in more localized soil disturbance and compaction compared to alternative B. Similar to alternative B, a proposed new trail linking the new Carter Meadow parking lot to the Carter Meadow Trail loop would cause some new soil disturbance and compaction. Parking areas proposed under alternative C would maintain the size and dimension as presented in alternative B. Increased visitation anticipated under alternative C could result in increased soil compaction and erosion. However, greater public use monitoring and trail maintenance under this alternative would alleviate or prevent potential problems from overuse or misuse of trails. Additional staffing under this alternative would allow monitoring for problems at all units and the WPA. We would close or restrict access if needed to protect sensitive areas.

Under this alternative, we propose creating about 2 miles of additional trails at the Benton Unit. These new trails would necessarily cause soil disturbance and compaction along the trail corridors during construction. However, the trails would be limited to wildlife observation uses such as walking, bird watching, nature viewing, snowshoeing, and cross country skiing. Other uses (already prohibited on this unit), such as mountain biking and off-road wheeled vehicles, would continue to be prohibited. Increased visitation anticipated under alternative C could result in some increased soil compaction and erosion. However, greater monitoring of public uses and enhanced trail maintenance under this alternative would alleviate or prevent potential problems resulting from over-use or misuse of trails.

We anticipate little increased visitation at Sandy Stream Unit and Carlton Pond WPA under alternative C. Therefore, no changes in adverse impacts are expected when compared to alternatives A and B.

Impacts on Vegetation

Healthy and diverse native vegetation is needed to support the forest, shrubland, grassland, and emergent wetland communities that sustain priority resources found on the refuge and WPA. We evaluated the management actions proposed for each of the CCP alternatives for their potential to benefit or adversely affect the native vegetation and accompanying habitat types found across each refuge unit and the WPA.

We evaluated the benefits of the management actions proposed under the three alternatives that would conserve or restore native vegetation, including:

- Land protection and conservation that would maintain existing vegetation.
- Habitat management activities and projects that would convert vegetation types in portions of the refuge, resulting in the localized gain of certain types of vegetation.
- Increased prevention and control of invasive species.
- Improved cooperation with partners to conduct inventory and monitoring of vegetation.

We also evaluated the potential for adverse impacts to vegetation, including:

- Habitat management activities and projects that would convert vegetation types in portions of the refuge, resulting in the localized loss of certain types of vegetation.
- Activities of refuge and WPA visitors that might directly impact vegetation.
- Construction of public use infrastructure that would result in a localized loss of vegetation.
- Increased recreational use of refuge and WPA lands that could lead to vegetation impacts.

Impacts on Vegetation That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—Regardless of which CCP alternative we select, we would continue to conserve the nearly 3,461-acre freshwater wetland-peatland complex at the Sunkhaze Meadows Unit. This includes maintaining the mix of open water, freshwater marsh, and beaver marsh, and protecting the ecological integrity of 1,649 acres of peatland.

Under all alternatives and at all refuge units and the WPA, we would continue to respond to reports of invasive species that cause environmental harm, such as decline of native species and disruption of environmental processes. We would continue to employ an integrated pest management approach and use adaptive management to control invasive plant species on all three refuge units and Carlton Pond WPA. We would also continue to promote visitor and public awareness of invasive plant species issues and continue education and interpretation of vegetation to encourage volunteer based control of invasive plant species. Alternatives B and C would directly result in greater invasive plant control on the refuge and WPA if proposed staff are authorized and funded.

At Carlton Pond WPA, we would use the water control structure to maintain the balance of open water (approximately 285 acres) and freshwater marsh (approximately 440 acres) and the 33 acres of peat bog. The earthen dike would be kept free of woody vegetation to maintain its

structural integrity, which is critical to maintaining the open water-vegetation composition of Carlton Pond. There are no differences in the vegetative benefits or impacts among the three alternatives at Carlton Pond WPA.

Impacts from Public Uses: Refuge visitation under all alternatives is anticipated to remain relatively low over the 15-year timeframe of this CCP. As a result, under all alternatives, existing vegetation is unlikely to be widely disturbed by on or off trail public uses.

Adverse Impacts

Land Protection and Habitat Management—Some refuge management actions, including invasive species control, would have short-term negative impacts on vegetation, such as removal of plants, herbicide use, trampling, and other potential damage to plant structure. These short-term, adverse impacts would be offset by providing long-term benefits to the diversity and health of the refuge's native plant communities through invasive species control.

Refuge administrative activities and public uses on the Sunkhaze Meadows, Benton, and Sandy Stream Units create some localized adverse impacts to vegetation. Concentrating public access on the trail networks and the use of boardwalks in sensitive areas creates localized damage to vegetation through clearing, trampling, or shading, but it ultimately helps limit potential adverse impacts to surrounding vegetation. Off trail uses such as orienteering, hunting, fishing, or berry picking are allowed on all refuge units and the WPA, but currently only a small number of visitors engage in these activities, and do so infrequently. We anticipate that short-term disturbances to vegetation would be offset by the increased awareness about the importance of native vegetation gained by refuge visitors as part of interpretive and education programming and displays.

Impacts from Public Uses—Public use activities have the potential to impact soils through trampling. Unauthorized uses, such as off-road vehicles or all-terrain vehicles, can indirectly affect vegetation by trampling or uprooting plants. The result can lead to increased soil erosion (Hammitt and Cole 1998). At Sunkhaze Meadows NWR and Carlton Pond WPA, off-trail use is allowed for pedestrian access (on foot) for the purposes of wildlife observation, photography, berry picking, snowshoeing, cross-country skiing, fishing, and hunting. We believe that the low level of participation and infrequent duration of these activities has little adverse impact on vegetation.

Impacts on Vegetation Under Alternative A (Current Management)

Benefits

Land Protection and Habitat Management— Alternative A would maintain the existing 5,000 acres of northern hardwood–mixed forest and 2,904 acres of conifer forest. Due to the lack of staff under this alternative, natural processes would be the primary mechanism for managing vegetation at the Sunkhaze Meadows Unit. Natural succession, natural disturbances, and site conditions (such as soil type and water conditions) would drive the composition and complexity of the plant communities. This would lead to more mature forest and less young forest over time.

Carlton Pond would continue to sustain 275 acres of conifer and mixed hardwood forest, 440 acres of freshwater emergent wetland, and 33 acres of treed peat bog. Similar to the Sunkhaze Meadows Unit, natural succession, natural disturbances, and site conditions would drive the composition of these plant communities.

At the Benton Unit, 95 acres of grassland would continue to be managed through a combination of mowing and prescribed fire. Without this active management the open grassland would likely revert first to shrubs, and eventually to forest. The refuge would continue to rely on natural processes within the Benton Unit's 155 acres of northern hardwood–mixed forest and conifer forest to maintain those habitats; through natural succession that forest would continue to mature and take on old growth characteristics, as mentioned for Sunkhaze Meadows Unit. The 13 acres of sedge meadow habitat would also be maintained largely through natural processes with occasional management through prescribed fire, mowing, or herbicide treatments that would result in short-term impacts to vegetation, but ultimately support and maintain desired species in these areas.

At the Sandy Stream Unit, the 39 acres of existing shrubland habitat would continue to be managed using primarily mechanical treatments such as mowing (with a brush-hog). Without this active management the shrub habitat would transition into mature forest. The refuge would continue to rely on natural processes within the floodplain forest along Sandy Stream to maintain a mature forest structure beneficial to wildlife and to protect water quality. The 25-foot wide riparian buffer of mature forest along Sandy Stream would continue to provide some riparian vegetation.

Impacts from Public Uses— Impacts resulting from public use are similar to those described under *Impacts on Vegetation That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management— Early successional habitat (such as young, sapling-sized forests) requires active management to maintain, and would be reduced under this alternative. We would not conduct any forest or habitat management to create early successional habitat at the Sunkhaze Meadow Unit. Any early successional habitat on this unit would result primarily from natural disturbances, except for the existing 107 acres maintained by the electric utility companies along the transmission line right-of-way. The utility company periodically clears the woody vegetation along the corridor to keep the lines clear of vegetation. However, under alternative A, this regular maintenance clearing would not necessarily be undertaken in a manner or timeframe that creates early successional habitat beneficial to native wildlife species.

At the Sunkhaze Meadows Unit and Carlton Pond WPA, we would continue to rely on natural processes such as succession, wind throw, or disease to sustain the white cedar woodland fen. Without active management or monitoring of deer browsing and white cedar regeneration, this vegetation type would likely decline over time.

At Benton Unit, the 95 acres of grassland is still small relative to the habitat block size required by some grassland nesting birds, such as upland sandpiper and grassland sparrow, which prefer contiguous grasslands greater than 100 acres (NHFG 2006). The upland forest bisects the

existing grassland, thereby creating grassland patches with more “edge” (shrub or forested borders that structurally divide what would otherwise be open grassland areas). Under alternative A, we would have minimal capacity to monitor the response of nesting birds and plants to the vegetation treatments and adapt management if needed.

The 39 acres of shrub habitat at the Sandy Stream Unit is relatively small and has a large amount of edge habitat. Although shrubland birds are less area sensitive than grassland birds, patch size and edge effects are important to the nesting success of shrub birds (Schlossberg and King 2007, 2008). However, shrubland is an important habitat component within the larger landscape and Sandy Stream provides an opportunity to maintain and manage a shrub patch.

Across all refuge units and at Carlton Pond WPA, early detection of individual plants or small populations of invasive plants would be limited. Under alternative A, the level of invasive species monitoring and control would be modest, relying primarily on volunteer efforts. Early detection of individual plants or small populations of invasive plants would be limited, resulting in a higher probability of invasive plants expanding on the refuge and WPA.

Impacts from Public Uses—Impacts resulting from public use are similar to those described under *Impacts on Vegetation That Would Not Vary by Alternative*.

Impacts on Vegetation Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—Under alternative B, contingent on proposed staffing, we would increase our invasive species prevention and control efforts through conducting inventory and monitoring efforts to complete early detection of new invasive species. This would improve our ability to prevent invasive species from displacing native species, which support refuge and WPA priority resources.

Refuge staff would work more closely with the electric utility companies to manage the 107-acre transmission line right-of-way at the Sunkhaze Meadows Unit to create and maintain early successional habitat beneficial to migratory and breeding birds of conservation concern, such as chestnut-sided warbler and American woodcock. Improving our coordination with the transmission line company and its contractors would improve shrublands present at Sunkhaze Meadows Unit. This coordination with the parties responsible for vegetation management within the existing right-of-way are intended to result in less overall vegetation removal and would sustain longer term growth of grassland and shrubland within the 107-acre right-of-way.

Refuge staff would also monitor rare plant populations and other exemplary or rare plant communities, including the northern white cedar woodland fen, ensuring their continued viability on the Sunkhaze Meadows Unit where feasible. Increased monitoring would help us better understand what affects this habitat type and develop and implement management actions if needed to protect, maintain, or expand this habitat as needed, both on and off the refuge.

We would manage the 2,904 acres of conifer and 5,002 acres of northern hardwood–mixed forests at Sunkhaze Meadows Unit to promote a self-sustaining, late successional forest. Over

time, this would increase the acreage of older forest and reduce the amount of young forest (less than 40 years old). Older, mature forest and associated structural characteristics, such as large woody debris, large diameter trees, and diverse lichen communities, are limited in the surrounding landscape and across Maine (Hagan and Whitman 2004). Maintaining an emphasis on late successional forest on the refuge complements the surrounding land uses, which are largely cut over forests or rural residential and commercial lands. Late successional forest management also helps protect the ecological integrity of the Sunkhaze Meadows Unit's peatland-wetland complex by providing a large forested buffer around the wetland complex. We would initiate forest health and condition assessments for forests at the Sunkhaze Meadows Unit to inventory and monitor for pests and other threats to help us maintain large areas of forest vegetation.

Similar to the Sunkhaze Meadows Unit, we would conduct a forest health and condition assessment at Carlton Pond WPA and the Benton Unit to determine the current condition of forests and determine if any active forest management is needed to promote a late successional forest. We would also work more closely with partners in the Carlton Pond watershed to protect more wetland and upland habitats. These actions would help protect the existing vegetation of Carlton Pond from potential degradation through introduced pests or invasive species.

At the Benton Unit, the amount of grassland would increase from 95 acres to 114 acres, and the amount of forest would decrease from 226 acres to 207 acres, by potentially converting 22 acres of conifer forest to grassland and allowing 3 acres in the north-central portion of the Unit to revert to forest. Under alternative B, we would evaluate the feasibility and benefit to migratory birds of converting the 22 acres of mature forest in the center of the unit to grassland. Overall, there would be a beneficial increase and continuity of grassland habitat.

The floodplain forest of the Sandy Stream Unit would increase from 19 acres to 21 acres as a result of increasing the forested buffer along Sandy Stream from 25 feet to 90 feet. Under alternative B, we would stop management mowing within the 90 foot buffer and allow the area to eventually transition into mature forest. Shifting the existing snowmobile trail, which currently bisects the shrubland habitat, to the edge of the habitat along Prairie Road would also restore shrub habitat, creating a more connected habitat across the site.

Impacts from Public Uses—Impacts resulting from public use are similar to those described under *Impacts on Vegetation That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—The emphasis on late successional forest at the Sunkhaze Meadows Unit under alternative B would limit the amount of early successional habitat on the refuge, primarily to the area along the transmission line and any openings created through natural disturbances.

The amount of northern hardwoods-mixed forest at the Benton Unit would increase by 3 acres through conversion of grassland towards a more northern hardwoods-mixed forest over the next few decades. This conversion would result in a corresponding loss of 3 acres of grassland habitat. This loss could be offset if the Service determines through further research to convert the

central 22 acres of forest to grassland habitat, thus increasing grassland from 95 to 114 acres. This conversion would result in a corresponding loss of forest habitat from 226 acres to 207 acres.

The expansion of the riparian buffer at the Sandy Stream Unit from 25 feet to 90 feet would reduce the amount of shrubland habitat from 39 acres to 37 acres and result in a corresponding increase in forest cover over the long term.

Impacts from Public Uses—Small infrastructure construction projects, such as boardwalks and kiosk or signage installation at all units, would result in small-scale and localized loss of vegetation. We would take efforts to minimize the impacts of these projects on vegetation.

At the Sunkhaze Meadows Unit, newly proposed public use improvements, including a new trail linking the proposed new Carter Meadow parking area and existing Carter Meadow trailhead, and an additional parking area located at the Oak Point trailhead, would cause a long-term loss of vegetation where implemented. The Oak Point Trail parking area would impact an area approximately 35 feet by 55 feet. The Carter Meadow parking area would impact an area approximately 20 feet by 40 feet. Clearing and construction of these facilities would permanently displace vegetation in these small areas until the infrastructure would eventually be removed.

Visitors to the refuge can be transporters of invasive plants when seeds or other plant parts are moved from one area to another. The modest increase in visitation expected under alternative B would slightly increase the potential for invasive species introductions. Under alternative B, we propose having staff work to educate the visiting public to reduce introductions and would also monitor and control invasive species.

Increased visitation could also potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. However, we would monitor usage to prevent or correct any unauthorized off-trail use in order to minimize the potential of this adverse impact. The relocation of the snowmobile trail at the Benton Unit would result in a shift of habitat impacts from the central region of the shrubland to the edge along the road. The new trail corridor would necessarily cause destruction of vegetation; however, we believe there would be an overall benefit to shrub vegetation by removing the trail as a fragmenting feature.

Impacts on Vegetation Under Alternative C

Benefits

Land Protection and Habitat Management—At the Sunkhaze Meadows Unit, an additional 715 acres of young forest habitat would be created at Sunkhaze Meadows Unit over the course of the 15-year timeframe of alternative C. This would be achieved through tree harvesting patches totaling 55 acres of conifer forest and 660 acres of northern hardwoods-mixed forest within the existing 7,904 acres of northern hardwood-mixed forest and conifer forest. The patches of young forest, once cut, would be allowed to regrow and succeed to mature forest, creating a shifting mosaic of small forest openings within the surrounding mature forest.

As noted under alternative B, improved coordination with the transmission line companies and its contractors responsible for vegetation management within the existing right-of-way at the Sunkhaze Meadows Unit are intended to result in less overall vegetation removal, and would sustain longer term growth of grassland and shrubland within the 107-acre right-of-way.

Under alternative C, we would allow the 92 acres of grassland at the Benton Unit to succeed naturally to shrubland habitat, and maintain shrub conditions by mowing (with a brush-hog) every 10 years or as needed. Shrub-dependent species are also in decline in this region, and managing for shrub habitat is a Service priority. Managing for shrub shifts the management regime from annual mowing to once every 10 years, thus reducing the intensity and timing of impacts to the vegetation and associated wildlife.

At the Sandy Stream Unit, the 90-foot expanded riparian floodplain forest buffer along Sandy Stream would be enhanced by planting selected native trees typical of riparian forests (and considering potential shift in climate) within this corridor. This would benefit the floodplain forest by speeding up natural processes and also help ensure the appropriate native species populate the new forest growth. Similar to alternative B, shifting the existing snowmobile trail to the edge of the Sandy Stream Unit along Prairie Road would restore a more contiguous shrub habitat.

Impacts from Public Uses—Contingent on proposed staffing, alternative C would provide more public outreach and education to refuge visitors on the negative effects of invasive plant species. This would be particularly beneficial at the Sunkhaze Meadows Unit and at Carlton Pond WPA, where boaters have the potential to introduce aquatic invasive species such as Eurasian milfoil and purple loosestrife. We anticipate a larger trained volunteer corps that would assist in invasive plant monitoring and control, benefiting native plant species and associated habitats.

Adverse Impacts

Land Protection and Habitat Management—Creating 715 acres of new young forest habitat at Sunkhaze Meadows Unit would reduce the late successional forest cover by a corresponding amount: the mature forest cover would decrease from 7,904 to 7,191 acres. Although there would be loss of late successional forest characteristics within the 715 acres, the habitat manipulation would impact a small percentage (9 percent) of the overall forest habitat and the young forest would add to the habitat diversity on the Unit. The active management of 715 acres would create increased disturbance to vegetation through use of mechanized harvest equipment. This would be managed through the use of best management practices and by scheduling harvests outside of breeding and migration periods.

The 92 acres of grassland habitat at the Benton Unit would be allowed to transition into shrubland habitat, thus nearly eliminating grassland from this unit. Without the grasslands, a special use permit for haying would no longer be available as a cost-effective management tool. Instead, refuge staff would need to conduct the shrub management every 10 years at some cost.

Impacts from Public Uses—Similar to alternative B, a combination of infrastructure improvements, such as parking areas and expanded trails, as well as smaller infrastructure construction projects, such as boardwalks and kiosk or signage installation at all units, would

result in small-scale and localized loss of vegetation. Alternative C would likely result in a larger impact to vegetation from infrastructure improvements, due to a combination of increased maintenance of the Buzzy Brook Trails at the Sunkhaze Meadows Unit as well as the larger 3.4-mile trail network proposed for Benton Unit. We would take efforts to minimize the impacts of these projects on vegetation.

Alternative C anticipates a slightly higher level of visitation compared to alternatives A and B. This increase in vegetation could also potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. However, we would monitor usage to prevent or correct any unauthorized off trail use, to minimize the potential for this impact to occur.

Impacts on Migratory Birds

Migratory bird conservation was cited in the founding legislation for both the refuge and WPA. In addition to being the primary purpose of the refuge and WPA, supporting the conservation of migratory bird populations also fulfills a Service priority, because migratory species are considered Service trust species. Migratory birds include waterfowl, shorebirds, wading birds, marshbirds, and landbirds. We evaluated the management actions proposed for each of the CCP alternatives for their potential to benefit or adversely affect migratory bird habitats and use across each refuge unit and the WPA.

We evaluated the benefits of the management actions proposed under the three alternatives that would conserve migratory birds and their habitat, including:

- Land protection and conservation that would maintain existing habitat conditions.
- Habitat management activities and projects that would convert habitat types in portions of the refuge, resulting in the localized gain of certain types of habitat and cover.
- Increased prevention and control of invasive species.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of migratory birds.

We also evaluated the potential for adverse impacts to migratory birds and their habitat, including:

- Habitat management activities and projects that would convert habitat conditions in portions of the refuge, resulting in the localized loss of certain types of habitat.
- Activities of refuge and WPA visitors that might directly impact migratory birds or their habitat conditions.
- Construction of public use infrastructure that would result in a localized impact to migratory birds or their habitat.
- Increased recreational use of refuge and WPA lands that could lead to migratory bird impacts.

Impacts on Migratory Birds That Would Not Vary by Alternative

Benefits

Under all the alternatives the Service is committed to protecting and managing for migratory birds, in particular species of conservation concern listed in appendix A and their associated upland, wetland, and riparian habitats. However, the benefits to migratory birds vary slightly under each alternative, based on the proportion of different habitat types and the various management strategies employed to create and maintain those habitats.

Land Protection and Habitat Management—The following State endangered species have been documented at several refuge units and at Carlton Pond WPA: black tern (Carlton Pond WPA), least bittern (Carlton Pond WPA and Sunkhaze Meadows Unit), and sedge wren (Benton Unit). Under all alternatives, we would continue to rely strongly on our State partners at the MDIFW to help us monitor these populations. We would continue to protect and maintain these species through long-term protection of their habitats. We would continue to manage the water levels at Carlton Pond WPA to benefit the State endangered black terns, bitterns, and other waterfowl and waterbirds of conservation concern.

Invasive species can degrade habitat quality and availability for some species. We would monitor for, and control where feasible, any invasive plant species found on all refuge units and at Carlton Pond WPA. Invasive plants would be one of the primary threats to migratory bird habitat under all the alternatives, and at least some level of invasive species control would occur under all alternatives.

In particular, the freshwater wetland-peatland complex at the Sunkhaze Meadow Unit would continue to provide valuable habitat for waterfowl and marsh birds, such as American black duck, bitterns, sedge wrens, yellow rails, rusty blackbirds, and other songbirds. There is no anticipated difference in the amount and type of wetland habitats at Sunkhaze Meadows, Benton, and Sandy Stream Units, and Carlton Pond WPA, among the alternatives. Therefore, under all alternatives we anticipate no variation in the diversity of wetland-dependent migratory birds across the refuge units and WPA based on habitat composition.

Our furbearer management program at Carlton Pond WPA allows for the control of beavers and muskrats, two species that can damage the integrity of the dike and water level control infrastructure. This infrastructure is key to maintaining habitat for the wetland-dependent migratory birds at Carlton Pond, including the State endangered black tern.

We would also continue to manage the water control structure at Carlton Pond WPA to benefit nesting and migrating birds, including the nesting population of State endangered black tern and nesting American black ducks. Secretive nesting birds such as American and least bittern and rails would continue to benefit from the open water-freshwater complex maintained at Carlton Pond WPA.

Impacts from Public Uses—Under all alternatives, we would continue to offer opportunities for visitors to engage in wildlife observation, photography, interpretation, environmental education, fishing, and hunting. Visitors who participate in the refuge and WPA's public use programs, or

those who use the available infrastructure, including trails and the observation platform, gain an improved understanding and appreciation for the numerous species which depend on the refuge for breeding, foraging, and during migration. Additionally, visitors would be more aware of biological facts upon which Service management is based and why these species are important to people and other wildlife. This outcome would help increase public support for refuge and WPA management and habitat protection, as well as the Service and the Refuge System.

Adverse Impacts

Land Protection and Habitat Management—We would expect some disturbance to breeding and migrating birds from trail maintenance, invasive plant control, and habitat management activities at the Sunkhaze Meadows, Benton, and Sandy Stream Units. However, we would conduct most, if not all, of these management activities outside the nesting season and avoid critical breeding and migration periods.

Impacts from Public Uses—In general, the presence of humans disturbs most wildlife, which typically results in a temporary displacement without long-term effects on individuals or populations. Disturbance varies 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). In some cases there is a clear link between the extent of disturbance and either the survival or reproductive success of individuals (e.g. Schultz 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. Wildlife disturbance may be compounded by seasonal needs. For example, some species, like warblers, could be negatively affected by disturbance associated with bird watching particularly during the breeding season. When visitors approach nests too closely, they often cause the adult bird to flush exposing the eggs to weather conditions or predators (Banks and Bryant 2007; Miller et al. 2001).

Except for coyote hunting, the refuge and WPA's hunt programs will remain the same under all alternatives. Hunting of waterfowl has occurred on the Sunkhaze Meadows Unit and at Carlton Pond WPA for decades, including prior to refuge establishment. The refuge's hunt program follows Federal and State regulations for annual harvest levels and seasons by species. These regulations are set by the Service for each state based on what harvest levels can be sustained for a species without adversely affecting its overall Atlantic Coast Flyway population. As such, hunting results in individual losses, but the projected cumulative harvest would not jeopardize the viability of any harvested species' population. Some disturbance to non-target wildlife species may occur; however, those impacts should be minimal, because hunting pressure is low and occurs outside the breeding season.

Retriever trials at Carlton Pond WPA are also occasionally allowed (not more than a few days a year) under a special use permit. The dog trials are held in the latter half of August, outside the breeding season of migratory birds and are limited to a small section of the refuge. Given the infrequency and short duration of these activities, as well as the seasonal timing of the events in late summer or early fall, we do not anticipate any substantial or long-term impacts to wildlife. While there are no established boat launch sites on refuge lands, visitors are allowed to hand

carry small boats across refuge lands to launch them. Spring or summer boating activity along Sunkhaze Stream and at Carlton Pond to observe or photograph wildlife may cause some infrequent, localized disturbance to nesting waterfowl and shorebirds. Overall, effects should not be significant, because both the refuge and WPA already experience minimal public use. Additionally, there are no trails, buildings, or other infrastructure at the WPA. American black ducks and other ground nesting birds usually nest in areas that are not easily accessible to boaters. The State-endangered black tern nests in the wetland vegetation near the water, so their nesting locations are monitored and water levels controlled for their benefit. If deemed necessary, signs would be posted to warn photographers and other visitors not to disturb these birds. In addition, wildlife observers and photographers generally seek to minimize disturbance as it interferes with their activity. If disturbance becomes a productivity issue, we would work with the State to implement appropriate protective measures, such as temporarily closing portions of the pond, or temporarily closing refuge lands to boat launching.

Under all alternatives, we would continue to allow seasonal snowmobiling on existing trails at Sunkhaze Meadows Unit, Benton Unit, and Sandy Stream Unit. The snowmobile trails will continue to be maintained by local organizations. Given the time of year (winter), most priority conservation species for the refuge and WPA have migrated away from the refuge and WPA until spring. The snowmobile trail at the Sunkhaze Meadows Unit is located in an upland area, away from sensitive species and habitat, including overwintering habitat (e.g. waterfowl). Snowmobile trails at Sandy Stream and Benton Units are also located away from sensitive wetland habitats. These trails also occur near existing roadways that experience regular passenger vehicle traffic. These trails have been used for many years, and current and expected snowmobile traffic on these trails is not expected to add to the existing levels of disturbance. Therefore, we do not anticipate any additional impacts to migratory birds as a result of continuing this access.

Impacts on Migratory Birds Under Alternative A (Current Management)

Benefits

Land Protection and Habitat Management—Under alternative A, we would continue to rely on natural processes (e.g. succession and disturbance), rather than any active forest management, to maintain the current extent of forest habitat at Sunkhaze Meadows NWR and Carlton Pond WPA. For forest-dependent migratory birds utilizing Sunkhaze Meadows Unit, Benton Unit, and Carlton Pond WPA, mature trees with small scatterings of natural tree falls and other blow downs from natural disturbances create habitat conditions that benefit many migratory birds that rely on a diverse forest structure. Birds that use late successional forest structure, such as boreal chickadee and Cape May and bay-breasted warblers, would likely benefit the most. Migratory birds that use shrub and young forest habitat would continue to minimally benefit from the early successional habitat maintained along the transmission line right of way, and would benefit from any early successional habitat created through intermittent natural disturbances.

Grassland nesting birds would continue to benefit from the annual mowing or periodic burning of the 95 acres of grassland at the Benton Unit. Common species including tree swallows and red-winged blackbirds, and less common species including American kestrel, red-tailed hawk,

and eastern bluebird, also benefit from the current grassland habitat. The grassland provides a habitat type not available elsewhere on the other Sunkhaze Meadows NWR units.

Shrub-nesting birds such as American woodcock and willow flycatcher would continue to benefit from the maintenance of 39 acres of shrub habitat at Sandy Stream Unit. Although small, this shrubland is an important component within the larger agricultural and forested landscape. The 25-foot wide riparian habitat of mature forest along Sandy Stream provides a modest benefit to cavity-nesting birds, such as wood ducks.

Impacts from Public Uses—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—Our lack of staff limits our ability to monitor nesting birds and habitat conditions across all units of Sunkhaze Meadows NWR and Carlton Pond WPA. Similarly, we would have limited capacity to monitor potential impacts of public use, water level changes, or invasive species. This situation increases the probability that invasive plants could become established or expanded at any of the three refuge units and Carlton Pond WPA. Invasive plants are known to degrade habitat for migratory birds.

Under this alternative, we would not actively manage for migratory bird species, such as chestnut-sided warbler and American woodcock, which are dependent on shrubland and young forest early successional habitats at Sunkhaze Meadows Unit. While this unit maintains some areas of this habitat type, the limited availability of resources to manage and maintain these habitat types would likely result in the loss of these transitional habitats as they either convert into more mature forests, or are completely cleared for right-of-way vegetation management purposes.

The lack of staff would continue to limit our ability to manage for State-listed species at Carlton Pond WPA, such as the black tern. We would continue to maintain water levels that support black tern nesting during the breeding season, but we would be limited in our ability to monitor and respond to changes in nesting conditions at Carlton Pond.

The lack of staff would continue to limit our ability to evaluate and monitor Benton Unit grassland bird use for species such as bobolinks, and to modify our management accordingly to better meet wildlife objectives. Due to its size and large amount of edge habitat, the current management approach may not be creating the most optimal habitat conditions for many grassland bird species besides those currently supported (bobolinks, eastern meadowlark, and savanna sparrow). The State-threatened sedge wren has not been observed on the Benton Unit since 1992, when the land was acquired by the Service. The lack of staff to monitor for this species and others, and the limited ability to monitor the sedge meadow habitat, makes it less likely that this species, or other priority conservation species, would be detected on the Benton Unit.

At the Sandy Stream Unit, the relatively small size of the shrubland habitat, and its fragmentation by the bisecting snowmobile trail, would continue to limit the number of nesting migratory birds in this habitat.

Impacts from Public Uses—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

Impacts on Migratory Birds Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—Under alternative B, the eventual addition of staff would result in additional invasive species control across all refuge units and the WPA. This additional control would help maintain the biological diversity and integrity of existing habitats, including exemplary plant communities such as the northern white cedar woodland fen and freshwater wetland–peatland complex found at the Sunkhaze Meadows Unit. Controlling invasive species also helps maintain the existing native vegetation relied upon by priority refuge migratory bird resources for forage and cover.

Under alternative B, refuge staff would work more closely with the electric utility companies at the Sunkhaze Meadows Unit to manage the 107-acre transmission line right-of-way at the Sunkhaze Meadows Unit to maintain shrubland and grassland (early successional) habitat conditions that benefit migratory birds, such as American woodcock and chestnut-sided warbler. The management emphasis on mature (late successional) forest habitat would benefit a suite of migratory species that relies on the habitat structure associated with mature spruce-fir and mixed hardwood forests. These species would include bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, and olive-sided flycatcher. As with all the alternatives, the long-term protection of the 3,461-acre freshwater wetland-peatland complex would protect migratory birds that use these wetland habitats, including American black duck, sedge wren, yellow rail, American and least bitterns, and other migratory waterfowl and waterbirds.

With the eventual addition of refuge staff anticipated under alternative B, we would be able to more effectively monitor bird responses to habitat changes and public uses at all three refuge units and Carlton Pond WPA. In doing so, we would be able to implement an adaptive management approach to adjust management as needed. At the Benton Unit, this approach would include monitoring the effects of grassland mowing or burning on nesting birds. At the Sandy Stream Unit, we would monitor the effects of maintaining shrub habitat and a wider riparian buffer in migratory birds. We would also be able to more effectively monitor bird populations and control and monitor those invasive plants at Carlton Pond WPA that could negatively impact aquatic habitats for migratory species, including the State-endangered black tern and nesting waterfowl and waterbirds. At the Sunkhaze Meadows Unit, we would monitor the potential effects of public use on migratory birds, especially within the wetland-peatland complex.

At the Benton Unit, the conversion of 3 acres of grassland to forest and, if implemented, 22 acres of northern hardwoods-mixed forest to grassland, would increase the grassland habitat from 95 acres to 114 acres. This conversion would potentially benefit grassland nesting birds that prefer larger grasslands, such as eastern meadowlark, grasshopper sparrow, and upland sandpiper.

Expansion of the riparian floodplain forest habitat along Sandy Stream from 25 feet to 90 feet would improve the size of this habitat for some migratory and resident birds, including wood duck, pileated woodpecker, and other cavity-nesting birds. Moving the snowmobile trail to the western border of the Sandy Stream Unit and closing the trail that currently bisects the shrub habitat would improve the overall connectivity of the shrub habitat for species such as American woodcock, willow flycatcher, among others.

Impacts from Public Uses—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—Additional invasive species control proposed across all refuge units and the WPA would result in the application of herbicides and the temporary loss of vegetative cover. Adverse impacts from herbicides are minimized by applying the herbicide per label instructions and implementing the refuge's spill prevention and control measures. The temporary loss of vegetation would occur seasonally and consist of small and localized areas that would have minimal impact on vegetation relied upon by priority refuge migratory bird resources for forage and cover.

The emphasis on late successional forest under alternative B would limit the amount of early successional habitat available at the Sunkhaze Meadows Unit primarily to the transmission line right-of-way and occasional openings created through natural disturbances. Species that depend on young forest or other open habitat, such as American woodcock and chestnut-sided warbler, would be limited by the amount of available habitat.

Adverse impacts for Carlton Pond are the same as those discussed under alternative A.

The loss of 3 acres of grassland at the Benton Unit would have a negligible loss of available habitat for grassland birds. Because this area is currently surrounded by forests on three sides, it provides minimal benefits to nesting grassland birds. The potential conversion of 22 acres of northern hardwoods-mixed forest at the Benton Unit would convert this area from forest to grassland. This conversion is expected to have a small loss of nesting habitat for forest and edge-dwelling species as well as a small loss of migratory stopover habitat for similar species. The increase in grassland from 95 acres to 114 acres would result in a modest increase in disturbance due to an increase in the acres mowed or burned. Because the management occurs outside the breeding season, we anticipate minimal adverse impacts from the increase in management activity.

Impacts from Public Uses—A modest increase in visitation is anticipated under this alternative. This increase could potentially result in added off trail usage and impacts as a result of the added presence and disturbance associated with more frequent visitors. However, we would monitor usage to prevent or minimize disturbance to migratory birds across all refuge units and at Carlton Pond. The addition of a 0.5-mile long foot pedestrian trail at the Benton Unit could increase disturbance to grassland nesting birds; however, the trail is proposed to run along the edge of the field. We see a benefit to increasing public pedestrian access at the Benton Unit by increasing public awareness and appreciation of wildlife and associated habitats and the management that is

required to maintain these conditions. Under alternative B, we would increase our public outreach and education to reach visitors with these messages. At the Sunkhaze Meadows Unit we would close trails and maintain other trails to minimize adverse impacts to migratory birds, as well as improve trail signage and interpretive materials to educate visitors about migratory birds and their habitats. We anticipate little change in visitation at Carlton Pond or Sandy Stream.

Impacts on Migratory Birds Under Alternative C

Benefits

Land Protection and Habitat Management—With the eventual addition of refuge staff anticipated under alternative C, we would be able to more effectively monitor bird responses to habitat changes and public uses at all three refuge units and Carlton Pond WPA in a manner similar to alternative B.

An additional 715 acres of young forest early successional habitat would be created at the Sunkhaze Meadows Unit under alternative C, benefiting American woodcock and chestnut-sided warbler and other migratory birds dependent on young forest and similar open habitats. This outcome would be achieved through tree harvesting patches totaling 55 acres of conifer forest and 660 acres of northern hardwoods-mixed forest within the more than 7,191 acres of remaining northern hardwood-mixed forest and conifer forest. The patches of young forest, once cut, would be allowed to regrow and succeed to mature forest, creating a shifting mosaic of small forest openings within a much larger mature forest. Thus, a majority of the forested habitat at the Sunkhaze Meadows Unit would still provide habitat for migratory birds that use mature and older forests. As with alternative B, we would work closely with the utility company to manage the transmission line corridor to benefit species such as American woodcock, chestnut-sided warbler, and other species that use shrub and young forest habitats.

Shrub-dependent birds such as American woodcock, willow flycatcher, eastern kingbird, and eastern towhee would benefit from the conversion of the 92 acres of grassland to shrubland at the Benton Unit as proposed under alternative C. With more refuge staff anticipated under alternative C, we would be able to more effectively monitor bird responses to these habitat changes, including the conversion of grassland to shrubland habitat. Additional staff would also help us manage this transitional habitat type, which would require mowing every 10 years. Current benefits to migratory birds at the Sandy Stream Unit and Carlton Pond WPA would be similar to alternative B under this alternative.

Impacts from Public Uses—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—Under alternative C, the amount of mature late successional forest at the Sunkhaze Meadows Unit would be reduced by 715 acres, thus reducing available habitat for migratory birds that depend on older forest conditions. However, the remaining 7,191 acres of mature forest habitat would remain, so the relative change in mature forest habitat is modest compared to the other alternatives. The active tree harvesting within the

715 acres would create some disturbance; however, the harvesting would be scheduled outside breeding season to minimize impacts to migratory birds.

Because of the conversion of 92 acres from grassland to shrubland at the Benton Unit, habitat for grassland dependent birds such as bobolinks would disappear over time on this unit as the grassland would be allowed to revert to shrubland under this alternative.

Impacts from Public Uses—Alternative C anticipates a slightly higher level of visitation compared to alternatives B, particularly at the Sunkhaze Meadows Unit and the Benton Unit. Both of these units under alternative C propose maintaining or adding to the trail network. This could also result in added off trail usage and impacts as a result of additional human presence and unintentional disturbance to breeding birds. However, we would monitor usage to prevent or correct any unauthorized off trail use to minimize the potential of this impact.

Extending the coyote hunting season by one month, until the end of April, could have unknown negative effects on breeding birds on the refuge. Many raptor species begin nest building and breeding in March and April and continue into May, such as osprey (Poole 1984, Wetmore and Gillespie 1976), red shouldered hawk (Portnoy and Dodge 1979), and northern goshawk (Speiser and Bosakowski 1991).

Currently, coyote hunting is the only State season where hunting is allowed during the spring and at night as well as during the day. Under this alternative, expanding the coyote hunting season would expand the duration and potentially intensity of authorized off trail use on the refuge. There are several studies documenting disturbance effects of hunting on wildlife (see Sexton and Stewart 2007 for a summary). There are also many studies that document human and canine disturbance of wildlife (e.g., Miller et al. 2001, Banks and Bryant 2007, Lenth and Knight 2008). Cumulatively, noises associated with humans (and dogs) can be disruptive enough to birds to keep them away from their nests (Call 1979, Ratcliffe 1980). The potential for any animal to flee its nest generally increases when the perceived threat approaches more directly (Burger and Gochfeld 1981, 1990, Cooper 1997, 1998). Brief absence by parent birds can lead to missed feedings, predation on eggs or young, or exposure to overheating, chilling, or dehydration of eggs or young (Call 1979, Suter and Joness 1981). Species like the ferruginous hawks tend to desert their nests if adults are exposed to human activity during incubation (White and Thurow 1985). Van Daele and Van Daele (1982) found that incubation at successful osprey nests occurred during 99.5 to 100 percent of daylight hours. For some warblers and similar species, nest guarding by males in response to a disturbance can reduce the rate of egg losses to predation, but the time and energy spent in nest guarding results in time not spent provisioning young or self-feeding. This trade-off can not only cause current offspring to starve, but also impact the parents' survival and future reproduction (Komdeur and Kats 1999). Ground nesting birds may also be affected by disturbance during the nesting season. In the Appalachian Mountains, exposure was a leading cause (44 percent) of ruffed grouse chick mortality – equal to the combined predation by both birds and mammals (Smith et al. 2004). Human disturbance through noise and off trail use during the critical periods of incubation and the early nesting stages can be fatal to embryos and nestlings.

Adverse impacts to migratory birds at the Sandy Stream Unit and Carlton Pond WPA would be similar to alternative B under this alternative.

Impacts on Fish and Mussels

We evaluated the management actions and public uses each of the alternatives proposed for their potential to beneficially or adversely impact fish and mussel species.

We evaluated the following proposed actions for their potential to cause beneficial impacts on fish and mussels:

- Protecting and managing land that would provide watershed benefits.
- Protecting or restoring emergent wetlands and riparian forest habitats.
- Controlling invasive species.
- Working with partners to improve education and outreach related to fish and mussels present on the refuge and WPA.

We evaluated the following proposed actions for their potential to cause adverse impacts on fish and mussels:

- Habitat management activities or projects that may result in temporary losses of vegetation near waterways.
- Applying herbicides to manage invasive species.
- Increased recreational use of refuge and WPA lands that could lead to fish and mussel impacts.

Impacts on Fish and Mussels That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—The staff from Maine Coastal Islands NWR would continue to work with the Service's Fisheries Program to maintain self-sustaining, healthy populations of native fishes at Sunkhaze Meadows NWR and Carlton Pond WPA. This includes American eel and brook trout, which occur on the Sunkhaze Meadows Unit and are species of conservation concern. The federally listed Atlantic salmon occurs downstream from the Sunkhaze Meadows Unit and is discussed under *Impacts on Threatened and Endangered Species*.

At the Sunkhaze Meadows Unit, the wetland-peatland complex, including Sunkhaze Stream and its tributaries, would be protected and maintained under all alternatives. Protecting Sunkhaze Stream and its tributaries benefits a number of warm water and cold water fish species.

Under all alternatives, the Service would continue to rely on our State and Federal partners to help monitor populations of fish in Sunkhaze Stream and to help control the introduction of nonnative species that could affect native fish and mussels. We would continue to protect the health of aquatic habitats including Sunkhaze Stream and its tributaries. Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat primarily for warm water fish and, to a lesser extent, cold water fish species.

Continuing to manage the water control structure at Carlton Pond WPA to maintain stable water levels would continue to support the existing warm water fishery found within Carlton Pond.

Two State-threatened freshwater mussel species are known to occur on the Sandy Stream Unit: tidewater mucket and yellow lampmussel. Under all alternatives, we would continue to rely strongly on our State partners at the MDIFW and the MNAP to help us monitor these populations. These freshwater mussels depend on well-oxygenated water with minimal waterborne sediments and pollutants, as well as food sources such as algae, bacteria, and plant debris. Protection of the existing streambank and forested buffer along Sandy Stream under all alternatives prevents runoff and erosion from Service-owned land, which helps protect water quality and contributes plant debris to the food chain in Sandy Stream, thus benefiting the freshwater mussels as well as fish.

The Benton Unit has little fish habitat except for Fowler Brook, the small stream that crosses the property. However, long-term protection of the aquatic and surrounding upland habitats at the Benton Unit would continue to protect any fish species found within Fowler Brook.

Impacts from Public Uses—We would also continue to work with the MDIFW on outreach, education, and law enforcement related to fisheries. Working together on these needs will help ensure Federal and State regulations are followed, thereby helping to ensure long-term protection of fish and mussels on all refuge units and the WPA. Under all alternatives, we would continue to offer opportunities for visitors to engage in wildlife observation, photography, interpretation, environmental education, fishing, and hunting. Visitors who participate in the refuge's and WPA's public use programs, or those who use the available infrastructure, including trails and the observation platform, gain an improved understanding and appreciation for the numerous species which depend on the refuge including fish and mussel species. Additionally, visitors would be more aware of biological facts upon which Service management is based and why these species are important to people and other wildlife. This outcome would help increase public support for refuge and WPA management and habitat protection, as well as the Service and the Refuge System.

Adverse Impacts

Land Protection and Habitat Management—We do not anticipate any adverse impacts to fish and freshwater mussels from our habitat management activities at any of the refuge units or Carlton Pond WPA.

Impacts from Public Uses—Anglers walking along the streambank at the Sandy Stream Unit could lead to erosion and sedimentation. However, we anticipate minimal adverse impacts based on what appears to be a low level of use of this section of the river by anglers.

Fishing does remove individuals from the population. However, the State sets catch limits, designated waters, and fishing seasons to protect the State's fish populations. Given the distribution of these species and the State's estimates of abundance, we do not expect fishing pressure at Sunkhave Meadows Unit, Sandy Stream Unit, or Carlton Pond WPA to have adverse effects on these species.

Motorized boating at the Sunkhaze Meadows Unit would create some potential impact to water quality through discharge of gasoline and oil and the potential introduction of nonnative plant and animal species carried on the boat. We anticipate these effects to be minimal based on the low levels of boaters using Sunkhaze Stream. Our trails at all three refuge units (there are no trails at Carlton Pond WPA) are located and maintained to minimize any adverse impacts to water quality. Any trail maintenance would therefore have minimal, if any, short-term impacts to aquatic habitats and associated species.

Impacts on Fish and Mussels Under Alternative A (Current Management)

Benefits

Same as those described under *Impacts on Fish and Mussels That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—The lack of staff would continue to prevent us from proactively monitoring fish and freshwater mussel populations at Sunkhaze Meadows NWR and Carlton Pond WPA. Given the lack of staff we would have limited ability to work with other landowners within the Sunkhaze Stream watershed to help protect water quality and habitats that support fish and freshwater mussels of conservation concern.

Impacts from Public Uses—Impacts resulting from public uses are similar to those described under *Impacts on Fish and Mussels That Would Not Vary by Alternative*.

Impacts on Fish and Mussels Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—Given the proposed increase in staff under alternative B, we would have greater ability to monitor fish and freshwater mussel populations at Sunkhaze Meadows Unit in collaboration with partners. This expanded capacity would provide more information on opportunities to enhance habitat conditions for these species. In addition, we would work more closely with neighboring landowners to encourage land stewardship that protects water quality and aquatic habitats within the Sunkhaze Stream watershed.

Benefits to fish and freshwater mussels would be modestly increased by expanding the riparian buffer from 25 feet to 90 feet along the refuge's 2,000 feet of streambank along Sandy Stream. This expanded buffer would improve our long-term protection against streambank erosion and also provide more permanent benefit from the downed trees and woody cover provided by the forested riparian corridor. Forested buffers of at least 90 feet proposed for Sandy Stream would protect water quality critical to invertebrates and freshwater mussels (Kiffney et al. 2003) and provide shade to the river, which is beneficial to brook trout and other aquatic species (Craig and Dickson 1990).

Impacts from Public Uses—Impacts resulting from public uses are similar to those described under *Impacts on Fish and Mussels That Would Not Vary by Alternative*.

Adverse Impacts

Same as impacts under *Impacts on Fish and Mussels That Would Not Vary by Alternative*

Impacts on Fish and Mussels Under Alternative C

Benefits

Same as alternative B.

Adverse Impacts

Same as alternative B.

Impacts on Mammals

We evaluated the management actions and public uses each of the alternatives propose for their potential to beneficially or adversely impact large and small mammals known to utilize refuge and WPA habitats.

We evaluated the following proposed actions for their potential to cause beneficial impacts on wildlife:

- Land protection and conservation that would maintain existing habitat conditions.
- Habitat management activities and projects that would convert habitat types in portions of the refuge, resulting in the localized gain of certain types of habitat and cover.
- Increased prevention and control of invasive species.
- Supporting deer populations through our proposed management for priority refuge and WPA resources.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of mammals or the habitats that sustain them.

We evaluated the potential of the proposed actions to cause adverse effects on wildlife:

- Habitat management activities and projects that would convert habitat conditions in portions of the refuge, resulting in the localized loss of certain types of habitat.
- Construction of public use infrastructure that would result in a localized disturbance to mammals or their habitat.
- Managing coyote and other hunting seasons.
- Increased recreational use of refuge and WPA lands that could lead to mammal disturbance.

Impacts on Mammals That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—Mammals at Sunkhaze Meadows NWR and Carlton Pond WPA consist largely of relatively common species found across the northeast. Most of these species are able to utilize a variety of forested, open land, and wetland habitats, and their

populations on the refuge would not be expected to change under each alternative. Maintaining each of the three Sunkhaze Meadows NWR units and Carlton Pond WPA as primarily undeveloped open space provides many of our native mammal species at least a portion of their annual needs of food, water, cover, and space. We anticipate no changes in wetland-dependent mammal species based on habitat conditions under any of the alternatives, since we are proposing no alternatives to existing wetland conditions. At each of the three refuge units, portions of upland habitat types would vary across the alternatives and resulting impacts to mammals are discussed under each of the alternatives. No changes in habitat types are proposed for Carlton Pond WPA under any alternative. As a result, this would maintain existing habitat conditions supporting mammals.

Under all of the alternatives we would maintain the conifer forests that include spruce-fir, hemlock, and northern white cedar forests to benefit a suite of species including white-tailed deer. This includes softwood cover areas identified by MDIFW as deer wintering areas that cover a portion of the Sunkhaze Meadows Unit and a small portion of conifer forest at the Benton Unit.

Trapping furbearers at Sunkhaze Meadows Unit and Carlton Pond WPA as a management technique would continue under each alternative and is expected to have direct and indirect effects on wildlife. Benefits include the management of populations of furbearers at sustainable levels; overcrowding can make populations more susceptible to disease outbreaks.

Impacts from Public Uses—Under all alternatives, we would continue to offer opportunities for visitors to engage in wildlife observation, photography, interpretation, environmental education, fishing, and hunting. Visitors who participate in the refuge's and WPA's public use programs, or those who use the available infrastructure, including trails and the observation platform, gain an improved understanding and appreciation for the numerous species which depend on the refuge and WPA including mammals. Additionally, visitors would be more aware of biological facts upon which Service management is based and why these species are important to people and other wildlife. This outcome would help increase public support for refuge and WPA management and habitat protection, as well as the Service and the Refuge System.

Adverse Impacts

Land Protection and Habitat Management—Existing habitat management activities that are aimed at setting back succession, such as invasive species control (all units and the WPA), prescribed burning (Benton Unit), and mowing (Benton and Sandy Stream units), would likely injure or kill some small to medium-sized mammals that are unable to find refuge or otherwise flee. However, we believe the risk to be low since most mammals are able to leave the treatment area or hide. There are no state or federally listed mammal species on the refuge or WPA. Because most mammals present in treatment areas are able to leave or hide, habitat management efforts are of short duration (usually less than a week), and treatment areas are relatively small (generally less than 20 acres), any impacts to mammals at the population level are expected to be minor.

Furbearer management is also expected to affect mammal populations at Sunkhaze Meadows NWR and Carlton Pond WPA. We conduct furbearer management according to Maine regulated

seasons and limits for the targeted species. We can also impose any necessary refuge-specific restrictions through the special conditions that may be placed on the trapping special use permits.

Trapping harvests and removes individuals of the species; however, impacts are not expected on these species at the population level. The anticipated direct impacts of trapping on wildife 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 to wildlife and humans.

Maine Department of Inland Fisheries and Wildlife considers most furbearer populations in the State to be stable (Caron 2013 personal communication). However, there is some concern about recent declines in fisher and bobcat harvests around the Sunkhaze Meadows Unit; there is also concern about over harvest of river otters in this area (J. DePue, MDIFW 2013 personal communication). As noted above, trapper reports show that an average of 15 beavers and 11 muskrats have been taken per year between 2001 and 2010. Other than these species, which have a high reproductive capacity, only one bobcat, one coyote, three fisher, four mink, six otters, one raccoon, and two skunks have been taken between 2001 and 2010. Because most furbearer populations are considered to be stable in the State, and because of the low harvest levels of other furbearer species that may not be stable (i.e., bobcat, fisher, and otter), we do not expect the refuge's trapping program to have adverse effects on furbearers at the population level.

Non-target species are sometimes taken incidentally through this trapping program. The experience of the trappers and the selection of the appropriate trap size would reduce non-target captures (Northeast Furbearer Resources Technical Committee 1996, Boggess et al. 1990). Lynx (federally listed, endangered) have not been documented on the refuge. Therefore, potential impacts to lynx are not expected. If lynx are identified on or near the Sunkhaze Meadows Unit, the refuge manager would work with the Service's Ecological Services office and the State of Maine to implement measures to prevent accidental take of lynx.

Impacts from Public Uses—An important component of refuge management includes maintaining a careful balance between wildlife conservation and public use. In a 1989 survey conducted by the Service, 82 percent of refuge units allowed wildlife photography and 13 refuges considered it harmful (USFWS 1990).

The primary impacts to wildlife populations from public use on the refuge would be those associated with disturbance and hunting of wildlife. We would expect short-term and long-term adverse effects (e.g., disturbance or mortality) on wildlife populations resulting from public use of trails and from other off trail allowed uses (e.g., berry picking, snowshoeing). Visitors and dogs cause temporary disturbance impacts on resting and foraging wildlife. Disturbances would vary by wildlife species involved and the type, level, frequency, duration and the time of year activities occur. Even when people stay on trails, they would have some effect on the behavior of many wildlife species. Furthermore, adverse effects to wildlife have been shown to be directly proportional to increases in the number of users (Beale and Monaghan 2004). According to the

study, groups of visitors using trails were more likely to cause behavioral changes in the animals studied when compared to individual visitors.

Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). There is evidence to suggest that species most likely to be adversely affected are those where available habitat is limited, constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 2001).

Lenth et al. (2006) found, in areas that prohibited dogs, mule deer were less active up to 50 meters from recreational trails. In areas that allowed dogs, mule deer showed reduced activity within at least 100 meters of trails. The same study found similar adverse effects for small mammals including squirrels, rabbits, chipmunks, and mice. This means that there is a certain area around recreational trails that becomes unsuitable habitat for certain wildlife species, even though the habitat would otherwise be suitable (Lenth et al. 2006).

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. Severinghaus and Tullar (1975) suggested that snowmobile disturbance might be energetically costly to deer. Although deer sometimes use snowmobile trails, those trails may not lead to the best foraging areas, or may help to concentrate foraging in a restricted area and contribute to overbrowsing. They recommended keeping snowmobile trails at least 0.5 miles from deer wintering areas. In a controlled experiment, Freddy et al. (1986) found that snowmobiles invoked flight responses in mule deer at distances less than 440 feet. Distances traveled by fleeing deer averaged 330 feet. Deer demonstrated low levels of response (alerting) up to distances of about 1,540 feet. Freddy et al. (1986) suggest that keeping snowmobile trails greater than 1,500 feet from deer would minimize any disturbance. The study found no evidence of increased mortality or impairment of reproduction, but deer may not have been disturbed often enough to show an effect.

The existing snowmobile trails are, at their closest point, approximately 2 miles west of the deer wintering area mapped within the Sunkhaze Meadows Unit. This 2-mile buffer consists of northern hardwood-mixed forest and peatland-wetland complex. This exceeds the recommended 0.5-mile buffer recommended by Freddy et al. (1986). At the Benton Unit, the existing snowmobile trail passes through the edge of a mapped deer overwintering area. However, the vegetation in this portion of the site has changed from forest to grassland since it was originally mapped. Therefore, this area does not currently contain suitable habitat for deer overwintering. Instead, the edge of the northern hardwood-mixed forest (where suitable overwintering may occur) is located approximately 500 feet to the north, although most deer likely overwinter further within the mapped deer wintering area, away from the forest edge.

We expect adverse impacts on mammals associated with snowmobiling to remain low for the following reasons: 1) this use is a traditional use of refuge lands and has been occurring for many years, 2) refuge staff have not observed adverse impacts to these species in all of these years, 3) snowmobile trails avoid deer wintering areas, and 4) this use is expected to remain low and is

therefore not expected to be intense or frequent. Under all alternatives, we would continue to monitor the refuge for potential impacts and would limit access or close areas as needed to protect resources. We would also continue to vary from State regulations in that we would not allow baiting on any refuge unit or at Carlton Pond WPA.

All alternatives include a hunt program for a variety of mammals, for example: deer, bear, moose, and coyote. In addition to potential disturbance discussed above, hunting also includes direct take of individuals from a population. MDIFW is responsible for the management of resident wildlife including resident mammal species. They use a variety of methods to assess population levels and develop harvest strategies.

Deer is the most commonly hunted mammal species on the refuge and WPA. Currently, we do not collect harvest data for the refuge and WPA. Wildlife Management District (WMD) 18, which includes the Sunkhaze Meadows Unit, had 258 deer harvested. WMD 23, which includes the Benton and Sandy Stream Units and Carlton Pond WPA, had 1,657 deer harvested. As discussed in chapter 2, deer populations vary considerably from region to region in the State largely due to severity of winter conditions, with highest densities found in southern Maine and lowest numbers found to the north. MDIFW allocates a specific number of permits and take methods across 29 individual Wildlife Management Districts based on previous harvest data, and deer abundance aerial surveys to ensure healthy populations of deer within the State.

MDIFW also monitors the State's moose population. Aerial surveys are conducted in nine WMDs to count the number of bulls, cows, and calves. Based on these surveys, MDIFW estimated the 2011 Statewide moose population to be 76,000. These surveys, combined with data collected on female moose reproduction, survival rates obtained by aging teeth, and hunter sight-rate data, allows MDIFW to ensure that the harvest is in keeping with a healthy moose population. In 2011, 2,582 harvested moose were checked into hunt stations; 38 moose were harvested in the WMD which includes the Sunkhaze Meadows Unit and 2 moose were harvested in the WMD which includes the Benton and Sandy Stream Units.

For more than 35 years, MDIFW has closely monitored bears to ensure their management decisions are based on current and sound information. Harvest levels are determined based on harvest data and samples of teeth collected which help to show population trends and the number of bears present in the population. The State regulates harvest by setting season length, bag limit, and legal methods of hunting. Most bears are harvested by hunting over bait (75 percent), 22 percent by hunting without bait (includes 6 percent that use dogs), and 3 percent in traps. The total harvest in 2011 was 2,400 with 137 taken in the WMD that includes the Sunkhaze Meadows Unit. Eight bears were harvested in WMD 23 which includes Benton and Sandy Stream Units and Carlton Pond WPA. No baiting is allowed on the refuge or WPA and bear trapping is not allowed which reduces harvest compared to surrounding areas.

In Maine, many smaller mammals such as coyote, bobcat, red fox, skunk, gray squirrel, woodchuck, porcupine, and red squirrel are also hunted. Currently the State's coyote population is between 10,000 to 12,000 in the winter and increases to 19,000 in spring. This number decreases due to the low number of pups that survive after birth. The coyote population would likely remain relatively constant unless wolves reestablish themselves in the State and then it is

believed the coyote population would decline (Jakubas 1999). There would need to be mortality rates greater than 70 percent for there to be a reduction in the population (Jakubas 1999). In 2011, 1,623 coyotes were taken in Maine through hunting and trapping, this is about 1.6 percent of the estimated winter abundance. Therefore, the refuge's hunt program is not expected to have a noticeable effect on the population of this species.

The bobcat is a trapped and hunted species that is distributed over most of the State (Morris 1986). The Bobcat Management System is used to manage bobcat populations in the State (McLaughlin 1995). The red fox population is distributed Statewide (Caron 1986) and is considered to be abundant and stable (Jakubas 2004). Red fox are hunted but most of the take for this species is through trapping. Harvests across the State in 2011 through trapping and hunting totaled 922. Population trends for the stripped skunk, porcupine, and woodchuck are unknown according to the State of Maine since harvests are not recorded. However, these species are commonly seen on the refuge, the WPA, and throughout the State.

While individual mammals are harvested as part of the refuge and WPA's hunt programs, because of the State's efforts to monitor and regulate harvest of resident mammal species, we do not expect adverse impacts at the population level from harvesting these species.

Impacts on Mammals under Alternative A (Current Management)

Benefits

Benefits under alternative A are described above under *Impacts on Mammals That Would Not Vary by Alternative*.

Adverse Impacts

Adverse impacts under alternative A are described above under *Impacts on Mammals That Would Not Vary by Alternative*.

Impacts on Mammals Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—Young forest habitats are beneficial to a range of wildlife species including some mammals, such as snowshoe hare and the predators that hunt them including bobcat and coyote. These openings in the forest, both permanent and temporary, often support fruit-bearing shrubs and other plants that provide important food for mammals and other wildlife. Many mammals including coyote, fox, and bear are opportunistic foragers and eat fruits when available. Under alternative B, at the Sunkhaze Meadows Unit we would work with the utility company to manage the transmission corridor as early successional habitat to provide both food and cover for mammals and other wildlife.

Under alternative B, we would increase wildlife monitoring and inventory, which would provide more baseline information on wildlife populations, habitat management impacts, and the effects of additional public use on mammals and other wildlife.

If it is feasible, we would convert 22 acres of forested habitat to grassland at the Benton Unit. This minimal increase in grassland would benefit herbivores such as white-tailed deer, woodchuck, and meadow vole by minimally increasing forage area. It would also have minimal benefits for species that hunt for insects and small mammals in these habitats, such as red fox.

Impacts from Public Uses—Benefits to mammals resulting from public use under alternative B are described under *Impacts on Mammals That Would Not Vary by Alternative*. Any increase in visitation would improve our ability to provide visitors with a better appreciation and more complete understanding of the wildlife, including mammals, and habitats associated with the refuge and WPA.

Adverse Impacts

In addition to adverse impacts described under *Impacts on Mammals That Would Not Vary by Alternative*:

Land Protection and Habitat Management— If we convert 22 acres of forested habitat to grassland at the Benton Unit, it would decrease the amount of edge habitat on this unit and increase the overall acreage of grassland. Since many mammal species utilize edge habitats, decreasing edge habitat could have adverse impacts on these species. This impact is expected to be minimal as there would still by a substantial amount of edge habitat available on the unit, and this habitat is common locally and regionally.

Impacts from Public Uses— Compared to *Impacts on Mammals That Would Not Vary by Alternative*, under alternative B we expect some additional adverse impacts on mammals associated with opening Service lands to a limited number of new compatible uses (commercial guiding and orienteering) and the expected modest increase in visitation associated with additional refuge and WPA programs and events.

The anticipated increase in public use at the refuge and WPA could result in an increased level of disturbance to mammals. At current and projected levels of use, we expect only negligible adverse impacts to refuge mammals from opening the refuge to these additional uses. Given that we have had no requests to date for orienteering and few requests for commercial guiding, we anticipate the numbers of visitors participating in this activity and frequency of occurrence would be low, and would not add appreciably to the impacts associated with other, existing public uses of the refuge. Participants in these new activities 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 additional stipulations (see appendix B) and would be routinely checked by the refuge law enforcement officer for compliance with regulations and permit conditions. Permit conditions and stipulations are designed to minimize potential impacts.

Similar to opening the refuge and WPA to a limited number of new, compatible uses, we expect only negligible adverse impacts to refuge mammals from increased participation in environmental education and interpretation programs. Service staff would lead some of these programs, ensuring that activities and events were held in away from sensitive resources. Non-Service instructors would need to obtain a special use permit. This would allow refuge staff to place limitations on location(s), number of participants, and number of events to protect refuge

and WPA resources, and to monitor for potential adverse impacts associated with these activities. Although a substantial increase in impacts from increased public use is not expected in the near term, refuge staff would monitor impacts of these uses and respond, if necessary, to conserve the existing high quality of refuge resources. For additional details on these uses, please see appendix B.

Impacts on Mammals Under Alternative C

Benefits

Land Protection and Habitat Management—Alternative C would increase the amount of young forest habitat at the Sunkhaze Meadows Unit by 713 acres. These resulting patches of young forest habitat among a matrix of mature forest would benefit many wildlife species, including mammals, by creating additional foraging habitat. Insect and small mammal populations would likely be higher in these openings and thus attractive to mid and large-sized mammals.

Impacts from Public Uses—Benefits to mammals resulting from public use under alternative C are the same as those described under alternative B.

Adverse Impacts

Land Protection and Habitat Management—Despite the conversion of 715 acres of mature forest to young forest at Sunkhaze Meadows Unit under this alternative, it is a relative small area within the more than 7,000 acres of mature forest. Thus, we anticipate only short-term and relatively minor impacts to mammals within the forested habitats. Under alternative C, the 92 acres of grassland habitat at the Benton Division would revert to shrub habitat. This would eliminate that grassy habitat for herbivores and for mammals that forage on small mammals and insects within the grassland.

Impacts from Public Uses—Under alternative C, adverse impacts associated with public use are the same as described for alternative B, except under this alternative we would extend the refuge and WPA coyote hunting by one month (to April 30). This expanded season would likely result in additional individual coyotes being taken. However, given the regional population trends as stable or increasing, we do not anticipate a substantial decrease in the local population as a result of expanded hunting at Sunkhaze Meadows Unit and Carlton Pond WPA. There would also be some small amount of additional disturbance to other mammal species associated with extending the refuge and WPA coyote hunting season. We would monitor for potential impacts to refuge resources. If adverse impacts are observed, we would review the coyote hunt and modify the hunt program as needed.

Impacts on Other Native Wildlife (Amphibians, Reptiles, and Invertebrates)

We evaluated the management actions and public uses each of the alternatives proposes for their potential to beneficially or adversely impact reptiles, amphibians, and invertebrates known to utilize refuge and WPA habitats.

We evaluated the following proposed actions for their potential to cause beneficial impacts on reptiles, amphibians, and invertebrates:

- Land protection and conservation that would maintain existing habitat conditions.
- Habitat management activities and projects that would convert habitat types in portions of the refuge, resulting in the localized gain of certain types of habitat and cover.
- Increased prevention and control of invasive species.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of reptiles, amphibians, and invertebrates or the habitats that sustain them.

We evaluated the potential of the proposed actions to cause adverse effects on reptiles, amphibians, and invertebrates, including:

- Habitat management activities and projects that would convert habitat conditions in portions of the refuge, resulting in the localized loss of certain types of habitat.
- Construction of public use infrastructure that would result in a localized disturbance to reptiles, amphibians, and invertebrates or their habitat.
- Increased recreational use of refuge and WPA lands that could lead to reptiles, amphibians, and invertebrates disturbance.

Impacts on Other Native Wildlife That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—The status of amphibians, reptiles, and especially invertebrates on the refuge units and WPA is currently not well known. Across all alternatives, we do not anticipate any major changes in benefits or adverse impacts to these taxa, except under alternative C, which proposes an increase in young forest habitat at Sunkhaze Meadows Unit and a decrease in grassland habitat at the Benton Unit; these are described in more detail below. The aquatic habitats surrounded by upland at Sunkhaze Meadows and Carlton Pond are critical both in habitat structure and water quality to reptiles and amphibians, and they would be maintained under all of the alternatives. In addition, under all of alternatives we would continue to rely strongly on our State partners at MDIFW and the MNAP to help us monitor these wildlife populations.

Two State threatened invertebrate species are known to occur on the Sunkhaze Meadows Unit: Tomah mayfly and pygmy snakefly dragonfly. Under all of the alternatives, we would continue to rely strongly on our State partners at the MDIFW and the MNAP to help us monitor these populations. We would continue to protect and maintain these species through long-term protection of their aquatic habitats.

Habitat management techniques, such as maintaining Carlton Pond water levels, conducting prescribed burning and mowing at Benton, and controlling invasive species throughout the refuge and WPA, would be carried out to improve habitat conditions for a variety of wildlife species, including amphibians, reptiles, and invertebrates.

Impacts from Public Uses—Our public outreach information and programs include information on the importance of these taxa to the overall biological diversity of the refuge units and WPA. This inclusion in outreach and education helps increase awareness and appreciation of these species. This increase in understanding helps improve support for our habitat management and land conservation that helps sustain these species.

Adverse Impacts

Impacts from Public Uses—We would expect some localized, short-term and long-term adverse effects (disturbance or mortality) on wildlife populations resulting from public use of trails and from other off trail allowed uses (such as berry picking or snowshoeing). Disturbances would vary by wildlife species involved and the type, level, frequency, duration, and time of year in which activities occur. Even when people stay on trails, they would have some effect on the behavior of many wildlife species. Furthermore, adverse effects to wildlife have been shown to be directly proportional to increases in the number of users (Beale and Monaghan 2004). Because Sunkhaze Meadows NWR and Carlton Pond WPA are only expected to have a small rise in visitation under all alternatives, we do not believe that this type of disturbance would rise to a level of concern.

Impacts on Other Native Wildlife Under Alternative A (Current Management)

Benefits

Land Protection and Habitat Management—The maintenance of grassland at the Benton Unit provides direct benefits for reptiles and some amphibians due to the abundant food resources, particularly in older fields, that provide a diversity of plant and invertebrate life, and the complex soils. Several snake species, including brown and garter snakes, use grasslands for foraging, particularly if they are near woodlands with ample cover. Well established grasslands provide a diverse array of nectar sources and plant structures for pollinating, herbivorous, and predatory insects.

Impacts from Public Uses—Benefits to other native wildlife resulting from public use under alternative A are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—Under alternative A, the refuge would continue to remain unstaffed, which would prevent Service staff from conducting inventories required to identify amphibians, reptiles, and invertebrate populations present on refuge and WPA lands. In addition, we would be limited in our ability to monitor species response to habitat management, especially in response to maintaining grassland habitat at the Benton Unit and shrubland habitat at Sandy Stream. These habitats are likely to support the most diverse amphibian, reptile, and invertebrate communities compared to upland forest habitat.

Impacts from Public Uses—Adverse impacts to other native wildlife resulting from public use under alternative A are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative.*

Impacts on Other Native Wildlife Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—The increased width of the forested riparian buffer at the Sandy Stream Unit would provide additional protection to the rare mussels within Sandy Stream. A 90-foot riparian forest would also provide additional long-term inputs of leaves, sticks, and other woody material that would benefit aquatic invertebrates within Sandy Stream.

Proposed increases in staffing under alternative B would allow us to inventory and monitor populations of amphibians, reptiles, and invertebrate present on refuge and WPA lands. By completing these inventories and monitoring efforts, we would increase our knowledge and understanding of what species are present and how our management can benefit them.

Impacts from Public Uses—Benefits to other native wildlife resulting from public use under alternative B are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—Adverse impacts to other native wildlife resulting from land protection and habitat management under alternative B are similar to those described under alternative A, except that the potential for the addition of staff could eventually improve our inventory and monitoring capabilities, which would improve our ability to manage for amphibians, reptiles, and invertebrates when compared to alternative A.

Impacts from Public Uses—Increased visitation expected for all refuge units and the WPA could potentially result in added off trail usage impacts and disturbance to amphibians, reptiles, and invertebrate populations as a result of use. Service staff would continue to monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting, particularly of reptiles such as wood turtles.

Impacts on Other Native Wildlife Under Alternative C

Benefits

Land Protection and Habitat Management—The increase in young forest, early successional habitat by 715 acres at the Sunkhaze Meadows Unit would benefit invertebrates, such as pollinating bees and butterflies that prefer open, sunlit habitats. We would expect an overall greater diversity of insects in the early successional openings compared to the mature forest habitats.

The conversion of 92 acres of grassland to shrubland at the Benton Unit would likely increase habitat available for amphibians and reptiles. The effects of converting grassland to shrubland are not well documented by researchers, but the improved mobility and increased leaf litter available as a result of tree sapling and shrub establishment would likely improve conditions for a larger variety of reptiles and amphibians over the current grassland.

Impacts from Public Uses—Benefits to other native wildlife resulting from public use under alternative C are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

Adverse Impacts

Land Protection and Habitat Management—The conversion of 715 acres of mature forest to early successional, young forest habitat at the Sunkhaze Meadows Unit could have adverse impacts on some amphibians, such as red-backed salamanders and spotted salamanders. Amphibian populations in 2- to 20-year-old clearcuts were compared to populations in mature hardwood and hardwood-conifer forests by several studies (Harlow et al. 2000). All seven studies found higher amphibian abundance (2.3 to 9.3 times as many) in mature forest plots. The authors note that amphibian and reptile response to clearcutting varies with forest type, species, and other ecological considerations, such as moisture regime, amount of woody material, and leaf litter available. However, we anticipate that these are short-term impacts, and as the forest matures the amphibians would respond in kind to the habitat changes.

The conversion of the 92 acres of grassland habitat to shrubland habitat at the Benton Unit could adversely affect some amphibian and reptile populations. Leopard frogs prefer wet meadow/grassland habitat and turtles search for disturbed sites with exposed soils. Both of these conditions would likely be less suitable under alternative C. However, the shrub cover would benefit some species, such as wood turtle, which spends much of the non-winter season in shrub cover.

Impacts from Public Uses—The expansion of public use trails at the Benton Unit has potential increased adverse effects on forest amphibians. Red efts (the immature stage of red-backed salamanders) move into the upland forests during raining periods and would be exposed to increased pedestrian traffic. However, increased public awareness and outreach by refuge staff would help raise public awareness and minimize adverse impacts.

Impacts on Threatened and Endangered Species

We evaluated the management actions and public uses each of the alternatives proposes for their potential to beneficially or adversely impact federally listed threatened and endangered species known to use refuge and WPA habitats.

We evaluated the following proposed actions for their potential to cause beneficial impacts on federally listed threatened and endangered species:

- Land protection and conservation that would maintain existing habitat conditions.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of federally listed threatened and endangered species or the habitats that sustain them.

We also evaluated the potential of the proposed actions to cause adverse effects on federally listed threatened and endangered species, including:

- Increased recreational use of refuge and WPA lands that could lead to increased potential for disturbance to federally listed threatened and endangered species.

Impacts on Threatened and Endangered Species That Would Not Vary by Alternative

Benefits

Land Protection and Habitat Management—In December 2000, the wild Atlantic salmon populations in small coastal rivers in downeast Maine were listed as endangered under the federal Endangered Species Act (ESA). In 2009, Atlantic salmon from the Penobscot, Kennebec, and Androscoggin rivers were added to the ESA protection. The Penobscot River is considered to be the best site for successful Atlantic salmon recovery (USFWS 2009). Atlantic salmon migrate up the Penobscot River in summer to fall spawning sites. The lower reaches of Sunkhaze Stream are used by salmon as a holding or staging area during their summer migration north, although they have not yet been recorded on the refuge. Riparian protection and habitat conservation measures proposed throughout each alternative for the Sunkhaze Meadows Unit would maintain the aquatic and riparian habitats in and along Sunkhaze Stream and its tributaries to sustain suitable conditions to seasonally support Atlantic salmon.

The Service is currently reviewing the status of the American eel as a potential candidate for listing under the ESA. The American eel is native to the Sunkhaze Stream system and was documented on the unit in Birch Stream, one of the tributaries. As with salmon, we would maintain all wetlands and associated riparian habitats on the Sunkhaze Meadows Unit to maintain water quality and habitat.

Although recently de-listed from the Federal list, bald eagles are still protected under the Bald and Golden Eagle Protection Act. They are also still listed as State threatened by MDIFW. Under all alternatives, we would continue to maintain nesting and foraging habitat for bald eagles nesting at Sunkhaze Meadows Unit.

Impacts from Public Uses—Our public outreach information and programs include information on the importance of these species as listed species and to the overall biological diversity of the refuge units and WPA that support them. This inclusion in outreach and education helps increase awareness and appreciation of these species. This increase in understanding helps improve support for our habitat management and species conservation measures that helps sustain these important populations.

Adverse Impacts

We do not anticipate any adverse impacts on federally listed species from our habitat management or public use activities at Sunkhaze Meadows Unit or Carlton Pond WPA.

Impacts on Threatened and Endangered Species Under Alternative A (Current Management)

Benefits

Same as benefits described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

Adverse Impacts

Same as adverse impacts described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

Impacts on Threatened and Endangered Species Under Alternative B (Service-preferred Alternative)

Benefits

Land Protection and Habitat Management—With more refuge staff anticipated under alternative B, we would be able to monitor for Atlantic salmon and American eel in the Sunkhaze Stream system. We would also work more closely with surrounding landowners and other partners to encourage land stewardship that protects the water quality within the Sunkhaze Stream watershed.

Similarly, with additional staff, we would be able to monitor populations for breeding and foraging bald eagles located at the Sunkhaze Meadows Unit and at Carlton Pond WPA.

Impacts from Public Uses—Benefits to federally listed threatened and endangered species resulting from public use under alternative B are similar as those described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

Adverse Impacts
Land Protection and Habitat Management—Adverse impacts to federally listed threatened and endangered species resulting from our land protection and habitat management activities under alternative B are similar as those described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

Impacts from Public Uses—The anticipated increase in visitors to the Sunkhaze Meadows Unit could generate more potential for disturbance to nesting bald eagles. However, we would minimize any disturbance to nesting eagles through public outreach and by directing visitor use away from active nests.

Impacts on Threatened and Endangered Species under Alternative C

Benefits

Same as alternative B.

Adverse Impacts

Land Protection and Habitat Management—The proposed increase in early successional habitat in the forested areas of the Sunkhaze Meadows Unit would not adversely affect federally listed species, as the tree harvesting would be located away from any active eagle nests and away from Sunkhaze Stream and its tributaries.

Impacts from Public Uses—The proposed extension of the coyote hunting season by one month in spring could potentially have adverse impacts to breeding bald eagles on refuge and WPA lands. Eagles begin nesting in the winter months and raise their young until they fledge in mid-summer. Expanding coyote hunting, which often relies on off trail access and the use of dogs, has the potential to disturb nesting eagles at a critical period when they are nesting. In northern latitudes, eagles tend to lay eggs during March through mid-April (Buehler 2000). As noted in chapter 3, under objective 4.2 for alternative B, brief disturbances caused by the presence of humans and loud noises can have detrimental effects on nesting raptors and their young. For this reason, we would utilize some of the additional staff eventually added under this alternative to evaluate the location and intensity of coyote hunting on the refuge, to determine its long-term effects.

Impacts on Public Use and Access

Since refuge lands are held in the public trust by the Service, access is generally allowed for compatible, priority wildlife-dependent public uses. Uses are limited when Federal trust resources would be impacted; the activity would detract from achieving refuge purposes or the Refuge System mission; or when administrative resources are not available to ensure a safe, quality experience. Sunkhaze Meadows NWR and Carlton Pond WPA are open year round to a variety of wildlife-dependent public uses described previously in chapter 2.

The following section discusses the beneficial and adverse impacts of the three alternatives on the public uses of the refuge and WPA as well as other compatible recreational opportunities. For more specific information on the potential beneficial and adverse impacts of these uses, refer to the attached compatibility determinations (appendix B).

We evaluated the following management actions for their potential benefit or adverse impacts on public use and access that would result from implementing each alternative:

- Continuing to provide access for approved public activities.
- Improvement and/or new construction of visitor infrastructure, and the increased distribution of refuge information, to improve visitor experiences.
- Increased partnerships with local, regional, and State academic and recreational interests to encourage a diversity of sustainable opportunities.
- Increased outreach and Service visibility would promote resource stewardship and outdoor ethics.

We considered the following potential short- and long-term direct, indirect, and cumulative impacts on public use and access that could result from the actions above:

- Conflicts among uses (e.g., conflicts about safety and access)

- More informed public (e.g., about species, their habitats, and their conservation)
- More supportive public (e.g., of the refuge, the Refuge System, and the Service)
- Increases in visitation and its associated effects on the quality of the experiences and our ability to meet the public use demand.

Impacts on Public Use and Access That Would Not Vary by Alternative

Benefits

Under all alternatives, Sunkhaze Meadows NWR and Carlton Pond WPA would both continue to provide the existing six priority public uses. All three alternatives would continue to provide quality, compatible wildlife-dependent recreation that would allow a diversity of visitors to connect with nature in the outdoors. We would maintain our infrastructure to support those activities and provide safe access to them. Access to wildlife observation would continue to be provided along trails by hiking.

The benefits of providing the existing level of wildlife-dependent activities, with some modest increases under alternatives B and C, include helping meet the existing and future demands for outdoor recreation and education. Hunters, anglers, birders, and photographers would find high quality opportunities to engage their preferred pastimes at all refuge units and the WPA. Under all alternatives, we anticipate visitor use is likely to increase over time as local residents and visitors become more aware of refuge opportunities, and as we progress in creating new facilities and programs.

We would also continue to allow snowmobiling (on designated trails), cross-country skiing, and snowshoeing to facilitate wildlife observation and photography in the winter, when access on foot is difficult. Sunkhaze Stream, its tributaries, and Carlton Pond WPA would continue to be accessible by canoes, kayaks, or other small boats for fishing and wildlife observation. A variety of off trail uses would continue to be allowed at Sunkhaze Meadows NWR including berry picking, orienteering, hunting, fishing, and cross country skiing and snowshoeing in the winter.

By continuing to rely on the Friends of Sunkhaze Meadows NWR to assist with and develop interpretive programming at the Sunkhaze Meadows Unit, we would continue to promote visitation to the refuge despite the lack of staff specifically dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA.

Under all alternatives, Sunkhaze Meadows NWR and Carlton Pond WPA would continue to maintain its current operating hours and remain open year-round from sunrise to sunset.

Adverse Impacts

Under all alternatives, we expect that public awareness of the refuge would increase over time as population growth increases around the refuge and WPA. We expect this would also result in increased visitation across all refuge units. Depending on the eventual staffing level of the refuge and WPA over time, we may or may not be capable of meeting the demand as it increases: providing programs, creating and maintaining trails and other infrastructure, and providing adequate facilities for increased numbers of visitors (such as parking areas). Whether we would

be capable of meeting the increasing demand depends on our coinciding levels of staffing and the availability of partners and volunteers (such as the Friends of Sunkhaze Meadows NWR) to assist. The current absence of staff would also continue to limit our ability to maintain public use infrastructure, such as trails, boardwalks, kiosks, and interpretive materials over the short term.

The increase in visitation and level of various uses at the refuge could eventually change the quality of experience for many visitors. Some may opt to either forgo certain recreation activities due to issues like overcrowding, which can be a relative term based on the activity or individual, or choose other locations. The refuge is currently utilized by a small portion of the area's visitors, and if the expected increase exceeds the projected 15-year estimate, it could lead to additional impacts on the refuge, WPA, other public lands. We would work to avoid that by continuing to distribute our programs and authorized uses to minimize conflicts among users.

At all units of Sunkhaze Meadows NWR and Carlton Pond WPA, we would continue to limit public access to ecologically sensitive areas such as nesting sites during breeding seasons and high quality wetlands. We would make efforts to minimize the impact on public use and access to those locations and timeframes necessary for adequate species protection. In doing so, this restriction would have a minor localized effect on public accessibility.

Impacts on Public Use and Access Under Alternative A (Current Management)

Benefits

We would continue to maintain the current minimal level of programs and the variety of public use opportunities on the refuge and WPA. We would not expand permitted uses or programs. We would continue to allow public access for the current public use programs, which would continue to be largely lead by local volunteers and other partners. Service staff would continue to provide minimal maintenance of trails, observation towers, parking areas, and informational signs. Refuge law enforcement would continue to enforce current refuge regulations to provide a safe environment for refuge visitors.

Adverse Impacts

Under alternative A, the refuge and WPA would continue to remain unstaffed, which would continue to adversely impact public use. Even with current visitation levels, the lack of staff and resources specifically dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA inhibits the availability of public use and access. Trails and other infrastructure such as boardwalks, signs, and parking areas are minimally maintained, which can impact the levels and types of use by visitors throughout the year. Some trails, like the two Buzzy Brook Trails at Sunkhaze Meadows Unit, are naturally becoming inaccessible due to downed trees and overhanging vegetation.

We assume a nominal increase in visitation under alternative A, but less than as expected under alternatives B or C, which include potential additions of staff and public use programming. We envision an increase based on a general growth in awareness of the refuge and WPA over time as well as surrounding population growth. Eventually, the level of use could change the nature of the experience for many visitors. Should that occur, some visitors could choose to give up certain

recreation due to issues of crowding or behavior, or to visit alternate locations. We do not anticipate that projected increases would adversely affect resources or their use or enjoyment by visitors because projected increases are relatively small, and are expected to be spread out over time (i.e., time of day and time of year) and across all refuge units and Carlton Pond WPA.

Across all refuge units, the current lack of staff would continue to prohibit our ability to provide environmental education and interpretive programs across most refuge units and at Carlton Pond WPA. We would continue to rely on the Friends of Sunkhaze Meadows to provide the majority of public use programming at the Sunkhaze Meadows Unit. Reliance on volunteer-based programs such as these, while helpful, would continue to limit our ability to provide regular programs or an array of diverse opportunities.

Impacts on Public Use and Access Under Alternative B (Service-preferred Alternative)

Benefits

In addition to the benefits under alternative A:

The additional staff envisioned under this alternative, once they were eventually added, would help update and regularly maintain public use infrastructure such as trails, boardwalks, signage, kiosks, and displays. This would improve the quality of public use opportunities at all refuge units and Carlton Pond WPA.

With the envisioned additional staff, if hired, we would update the refuge Web site with the hunting regulations currently enforced on refuge lands. Additional staff would also help with regular updates to the Web site and to outreach materials for visitors.

Under alternative B, the opportunity for commercial guiding, under authorization by a special use permit, would be provided, which could increase public access and use by individuals who might not otherwise access refuge lands. At this time, we envision largely individuals or small groups (10 or less) engaging in commercial guiding on an occasional or regular basis. Should larger groups become more frequent, or be determined by us to be detrimental to wildlife depending on the timing and location of the activity, we have the ability to control the size of the group in order to ensure its compatibility with other public uses and our habitat goals.

This alternative also improves water access for fishing and wildlife observation at the Sunkhaze Meadows Unit. Improved boating and fishing access points would potentially be developed both on refuge, such as Ash Landing, and off refuge near the mouth of Sunkhaze Stream and on neighboring private land through partnerships. Expanding public use programs and commercial guiding would also potentially create additional opportunities for fishing at Sunkhaze Meadows Unit and Carlton Pond WPA as well.

At Sunkhaze Meadows Unit, we are proposing two new parking areas: one at the entrance of Carter Meadow Road, the second at the Oak Point trailhead. These parking areas together would provide safer access to trails. Currently, pedestrians have to park at the parking area located along the County Road and then walk nearly 0.1 miles along the County Road to access the

Carter Meadow Road and Trail to the south, or 0.25 miles to the north to access the Oak Point Trail. By developing small parking areas at each of the trail and entrances, we would greatly reduce the need for refuge visitors to walk along the County Road, which would improve visitor safety and access.

In addition to the two new parking areas at the Sunkhaze Meadows Unit, we would also create a new trail beginning from the proposed Carter Meadow parking area and paralleling the Carter Meadow Road but in the woods near the creek until it connects with the existing trailhead at the end of Carter Meadow Road. This new trail would create a more scenic access for wildlife observation than the current alternative, which is walking along the gravel road (Carter Meadow Road).

Expanded partnerships with the Friends of Sunkhaze Meadows NWR, surrounding municipalities, the Penobscot Indian Nation, local schools and universities, and other partners would improve the variety and interpretive depth of public use programming, as well as wildlife-dependent recreation and interpretive opportunities.

At the Benton Unit, a 0.3-mile connector trail linking the parking lot and the existing snowmobile trail would be created, which would improve public access to the unit and could result in a slight increase the visitation to Benton Unit for wildlife observation and interpretation.

Relocation of the snowmobile trail at the Sandy Stream Unit is proposed under alternative B. This adjustment would create and maintain a nearly equal length of trail or access to (or through) the site. As a result, we would continue to allow public access in the winter via snowmobile under this alternative.

Adverse Impacts

We envision a modest increase in visitation under this alternative resulting from increased awareness of the refuge and WPA over time generated by population growth, plus the eventual addition of staff, Web site improvements, and expanded public use programming. While not a large increase, over time the increased level of use could change the nature of the experience for many visitors. Should that occur, some visitors could choose to give up certain recreation due to issues of crowding or behavior, or to visit alternate locations. We do not anticipate that projected increases would adversely affect resources or their use or enjoyment by visitors because projected increases are relatively small, and are expected to be spread out over time (i.e., time of day and time of year) and across all refuge units and Carlton Pond WPA.

At the Sunkhaze Meadows Unit, the North and South Buzzy Brook Trails (3.0 miles and 2.4 miles, respectively) would be closed under alternative B. The closure of these two trails would reduce the long-term availability of public access in that area and would reduce the overall number and miles of trails available to visitors. However, these trails do not currently provide significant public use opportunities. Access to this area is via the privately owned Stud Mill Road, which is sometimes closed to traffic. In addition, the parking area for these trails is behind a refuge gate that is usually locked except during hunting season. Lastly, these two trails pass through forested wetlands, making them difficult to access and maintain.

Impacts on Public Use and Access Under Alternative C

Benefits

The anticipated benefits under alternative C are similar to alternative B, except:

The eventual addition of staff envisioned under alternative C would provide regular public use programming as well as develop and regularly update interpretive materials and the refuge Web site. At Sunkhaze Meadows Unit, we would develop woodcock management area interpretive materials, which would share the benefits of early successional young forest management and describe the rationale behind the conversion and management of 715 acres of this habitat type with the public. Combined, these improvements would help us expand opportunities for environmental education, interpretation, and wildlife observation and improve our communication about the importance of conservation and the role of the Refuge System.

Coyote hunting season on Service-owned lands would be expanded by one month through April 30. This would slightly increase the availability and duration of this particular available hunting opportunity. All other hunting seasons would be maintained similarly to other alternatives. Under alternative C, at Sunkhaze Meadows Unit, the two Buzzy Brook Trails would continue to be maintained and the current 5.4 miles of trails available to visitors would remain unchanged. Alternative C would also construct the two parking areas and the Carter Meadow streamside trail similarly proposed under alternative B. Opportunities for wildlife observation at the Sunkhaze Meadows Unit would also be increased through renovating the Carter Meadow observation deck and increasing trail maintenance. These actions combined would greatly increase the public use access opportunities available under this alternative. However, because of the difficulty in maintaining the Buzzy Brook Trails previously noted and the corresponding need for additional staff to address that need, this is not considered our preferred alternative.

Expanded partnerships with the Friends of Sunkhaze Meadows NWR, surrounding municipalities, the Penobscot Indian Nation, local schools and universities, and other partners would improve public use programming, as well as wildlife-dependent recreation and interpretive opportunities. As compared to alternative B, this alternative would result in increased programming at Carlton Pond WPA, as well as Benton and Sandy Stream Units.

A network of trails would be created at the Benton Unit to promote that area’s use for wildlife observation and interpretive purposes. This trail network would create a network of approximately 3.4 miles of trail and would be expected to increase visitation to Benton Unit more than under alternative B.

Adverse Impacts

The expanded coyote hunting season could potentially conflict with other priority public uses such as wildlife observation and photography. Impacts and conflicts with other uses are anticipated to be minimal, since coyote hunting occurs primarily at night.

Similarly to alternative B, alternative C would result in a slightly higher increase in visitation as compared to alternative B, resulting from added opportunities for public use programming. As

noted previously under alternative B, increased visitation can result in changes in visitor experience. We do not anticipate that the projected increase in alternative C that would adversely affect resources or their use or enjoyment by visitors because projected increases are relatively small, and are expected to be spread out over time (i.e., time of day and time of year) and across all refuge units and Carlton Pond WPA.

Impacts on the Socioeconomic Environment

We evaluated the socioeconomic effects in terms of the degree to which the proposed alternatives might affect the local economy, social structures, or quality of life of the local communities. To do this, we considered changes in

- Jobs and income to the local community from changes in staffing.
- Jobs and income from temporary construction work on the refuge and WPA.
- Expenditures in the local economy from changes in public uses of the refuge and WPA.
- Availability of opportunities for recreation that are in demand by the public.

Impacts on the Socioeconomic Environment are Common to all Alternatives

Benefits

Under each alternative, the refuge and WPA would provide minimal socioeconomic benefits by providing wildlife-dependent recreational opportunities and through the contribution of money to local economies through the purchasing of goods and services within the local community for refuge operations, and spending in the local area by refuge visitors. We will continue refuge revenue sharing payments under all alternatives, as stipulated under current law (16 U.S.C. 715s, as amended). These payments are expected to continue to provide minimal economic benefits to the communities surrounding the refuge and WPA. Recent payments and their contribution to each town are detailed in chapter 2, table 2.18.

Of the management activities that would not vary by alternative, protecting land, maintaining facilities, supporting research and Friends of Sunkhaze Meadows group activities at Sunkhaze Meadows Unit, and implementing existing priority public use opportunities would create small additional socioeconomic benefits for the Milford and Unity areas by providing a destination for wildlife observation, hunting, fishing, photography and other compatible activities. Visitors participating in these activities would purchase goods (e.g., bait, tackle, gas) and services (e.g., hotel accommodations, meals) within the surrounding communities.

Adverse Impacts

Ownership of property by the Federal Government effectively removes these properties from the local tax base. As long as the Refuge Revenue Sharing Act (16 U.S.C. 715s, as amended) is in effect, the Service would continue to somewhat offset the tax losses by making an annual payment in lieu of taxes to the local governments for all refuge units and the WPA. The amount of this payment is determined by Congress each year; however, recent payments to local governments have not equaled losses in tax revenue and we expect these payments to have negligible effect on the local governments' budgets.

Impacts on the Socioeconomic Environment Under Alternative A (Current Management)

Benefits

Socioeconomic benefits under alternative A are similar to benefits noted under Common to all Alternatives. Wildlife-dependent recreational activities and other priority public uses would continue to be provided at all refuge units and at the WPA, meeting a substantial level of public demand for these activities and adding to the quality of life of the local community and other recreationists and wildlife enthusiasts in the region.

Adverse Impacts

Same as those noted under *Impacts on the Socioeconomic Environment are Common to all Alternatives*.

Impacts on the Socioeconomic Environment Under Alternative B (Service-preferred Alternative)

Benefits

Alternative B would expand and improve opportunities for all six priority public uses.

If the five added staff envisioned under this alternative are eventually added to Sunkhaze Meadows NWR and Carlton Pond WPA, direct benefits to the local economy would be increased in terms of refuge staff jobs, income, and expenditures, and purchases of goods and services for refuge activities. The estimated staffing levels and related incomes that would potentially be added are detailed in appendix F. The proposed addition of staffing and funding would improve our ability to communicate with the community about the values of Service-owned lands and opportunities for recreation under this alternative.

Working with partners to improve access to, and programming for, wildlife observation, hunting, and fishing opportunities would likely contribute economic benefits to the local economy from increased out-of-town visitors and related expenditures within surrounding communities.

Additional refuge programs and surrounding population growth are anticipated to increase visitation modestly over the 15-year period of the plan, compared to alternative A. As a result, local economies would experience minimally increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures.

Upgrades to refuge management infrastructure and existing facilities, plus new construction projects (parking lots, trails, and signs) would minimally contribute to the local economy for labor, materials, and services.

Adverse Impacts

Same as those noted under *Impacts on the Socioeconomic Environment are Common to all Alternatives*.

Impacts on the Socioeconomic Environment Under Alternative C

Benefits

The anticipated benefits under alternative C are similar to alternative B, except:

In addition to the five full-time staff envisioned under alternative B, alternative C also intends to eventually add two seasonal positions specifically dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA. This would further increase benefits to the local economy in terms of jobs, income, expenditures, and purchases of goods and services for Service activities.

Full staffing under this alternative, should it occur, would provide additional refuge programs that are anticipated to increase visitation slightly more over the 15-year period of the plan compared to alternative B. This increase and an increased focus on expanded interpretive and educational programming would result in increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures compared to the other alternatives.

Adverse Impacts

Same as those noted under *Impacts on the Socioeconomic Environment are Common to all Alternatives*, except:

Conversion of grassland to shrubland proposed at the Benton Unit under this alternative would result in the loss of the small permit fee paid by the local farmer to the refuge for authorization to mow hay on this unit.

Impacts on Cultural and Historic Resources

Impacts on Cultural and Historic Resources That Would Not Vary by Alternative

Under all alternatives, we would continue to protect all archaeological or cultural resource sites known to be present on Service-owned lands. We would continue to limit public access and management activities near those sites. There are no known historic structures on Service-owned lands. If sites are identified that are eligible for the National Register of Historic Places, we would coordinate their protection with our Regional Archaeologists and the Maine State Historic Preservation Office (SHPO).

These actions would benefit these resources by providing long-term protection against disturbance and provide a location for research and interpretation.

Impacts on Cultural and Historic Resources Under Alternative A (Current Management)

Benefits

Same as those noted under *Impacts on Cultural and Historic Resources That Would Not Vary by Alternative*.

Adverse Impacts

The lack of staff would continue to limit our ability to inspect and protect known archaeological or cultural resource sites. It also limits our ability to develop partnerships and additional research opportunities to more fully understand the archaeological or cultural landscape of Service-owned lands.

Impacts on Cultural and Historic Resources Under Alternative B (Service-preferred Alternative)

The anticipated benefits under alternative B are the same as alternative A, except:

Benefits

New staff would help ensure consistent messaging would be included in both Service-led and partner-sponsored interpretive programming. This would help improve our communication of the significance of archaeological and cultural resources, their significance, and the importance of their protection and interpretation.

Under alternative B, if envisioned staff is added, we would pursue additional work with the Penobscot Indian Nation, the town of Milford, and other interested partners to explore opportunities for developing materials and programming that better interpret cultural resources. This effort would improve interpretive materials and public use programming and help visitors gain appreciation for the historic and cultural significance of Service-owned lands and resources within them.

Adverse Impacts

The lack of staff over the short term (or until their eventual addition) would continue to limit our ability to inspect and protect known archaeological or cultural resource sites. This also limits our ability to develop partnerships and additional research opportunities to more fully understand the archaeological or cultural landscape of Service-owned lands. With the eventual addition of staff proposed in alternative B, this potential for adverse impacts would potentially be reduced over the 15-year timeframe of this CCP.

Impacts on Cultural and Historic Resources Under Alternative C

Benefits

The anticipated benefits under alternative C are the same as alternative B.

Adverse Impacts

The anticipated benefits under alternative C are the same as alternative B.

Cumulative Impacts

According to the CEQ regulations on implementing NEPA (40 CFR 1508.7), a cumulative impact is an impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.

This cumulative impacts assessment includes the actions of other agencies or organizations, if they are interrelated and influence the same environment. Thus, this analysis considers the interaction of activities at the refuge with other actions occurring over a larger spatial and temporal frame of reference.

Air Quality

As documented in chapter 2, air quality around the refuge and WPA is generally below exceedance levels for various pollutants. Summers occasionally experience periodic high levels of ozone and particulates. However, these high levels are generally rare and of short duration. Primary sources of air pollutants are from wood burning and mobile sources such as cars, buses, trains, and aircraft. According to a summary produced by Maine's Department of Environmental Protection (DEP), the USEPA estimates that approximately 50 percent of all man-made air toxic emissions come from mobile sources (Maine DEP 2013).

Sunkhaze Meadows NWR and Carlton Pond WPA (combined) receive approximately 6,300 visits each year compared to the 49,000 vehicles per day (or more than 17.8 million vehicles each year) that travel on the nearby Interstate 95 near Bangor (MaineDOT 2011). We predict only a negligible adverse impact on regional air quality from Service activities, due to the small number of proposed staff, limited management activities, and limited vehicular access on refuge or WPA lands. Emissions from Service and visitor vehicles, snowmobiles, and motorized boats would continue to be negligible on Sunkhaze Stream and Carlton Pond. Management actions and public uses at the refuge or WPA would contribute negligibly to regional vehicle emissions compared to other nearby emission sources.

With our partners, we would continue to contribute to improving air quality through cooperative land conservation and management of forests and wetlands. Maintaining Service-owned land in natural upland vegetation or wetlands assures these areas would continue to filter out many of the air pollutants harmful to humans and the environment. We would also encourage the use of air quality BMP's when implementing construction and maintenance of infrastructure or habitat management actions. The combination of land preservation and BMP implementation would continue to minimize our impact on air quality.

Water Quality

As noted in chapter 2, waters found on Sunkhaze Meadows NWR and Carlton Pond WPA generally sustain good water quality. Sunkhaze Stream and its tributaries are classified as Class AA waters by Maine Department of Environmental Protection (MEDEP MRS Title 38 467

7(C)(8)). This designation is in part sustained by large expanses of wetlands, forest, and other natural landcover across its watershed. Tributaries on or adjacent to the Benton and Sandy Stream Units also sustain water quality designations by the State.

The long-term land protection and management activities proposed under all alternatives would provide broad water quality and hydrology protection by ensuring large areas for groundwater infiltration, buffering of outside inputs and pollution, and providing soil stability.

We anticipate little to no adverse impacts to water quality resulting from refuge management activities under any of the alternatives. Most Service-owned lands provide well-vegetated buffers against adjacent water bodies. Service staff would continue to adhere to best management practices for spill prevention and soil erosion and sedimentation controls when implementing management activities. We would continue to adhere to and update the Sunkhaze Meadows NWR and Carlton Pond WPA spill prevention plan. During proposed activities such as trail expansion, parking lot construction, and land conversion, we would continue to minimize the potential for soil erosion and runoff by implementing a series of BMP's during their implementation. In doing so, we would minimize the already small potential for adverse water quality impacts.

Expanded management, partnerships, and monitoring proposed in alternatives B and C would additionally help to ensure protection of waters located on Service-owned lands.

Cumulative Impacts on the Biological Environment

Our habitat management activities are complemented by the conservation work being completed by partners on lands across the landscape surrounding the refuge and WPA. The Lower Penobscot Forest Project is a 42,000-acre forest located to the east of Sunkhaze NWR that provides a connection to other conserved lands, including the refuge. This forest is jointly managed by TNC, the Forest Society of Maine, and the Maine Department of Conservation. TNC plans to purchase a conservation easement of 12,000 acres along the southeast border of Sunkhaze NWR to establish an ecological reserve. The remaining 30,000 acres will remain in sustainable timber production (TNC 2011). Additionally, the Penobscot Experimental Forest (PEF) is located in the towns of Bradley and Eddington, just south of the Sunkhaze Meadows Unit along the eastern side of the Penobscot River. It is owned in fee by the University of Maine and the U.S. Forest Service (USFS) has a lease to conduct research within the forest. The PEF consisted of 3,855 acres in 2009, with USFS research occurring on over 1,200 acres. The remaining portion of the forest is used by the University for research, teaching, and demonstration activities. The PEF is comprised primarily of mixed-wood stands of mature timber. Between 2001 and 2005, a total of 591of forest acres were harvested (Morrill and Kimball 2009). Combined, these conservation areas protect and manage mixed age forested habitats across a land area roughly three times the size of the Sunkhaze Meadows Unit.

Long-term forest protection and management for old growth and late-successional mature forests outlined in alternative B would complement the forest conservation efforts of other partners noted. However, our focus on old growth and late-successional forest management would provide one of the largest areas of mature forest protection. Other protected forests noted still include timber management as part of their management objectives. Thus, our focus will help

ensure long-term habitat for species reliant on mature forest habitat, which has generally been lacking across the landscape.

In contrast, under alternative C, conversion of 715 acres of mature forest to early successional young forest would create large blocks of early successional forest, which are also preferred by a suite of species of regional conservation concern. This habitat type is currently provided across the landscape as lands cleared for timber harvests begin to regrow and reestablish forest cover. However, the long-term reliability of this habitat in the surrounding landscape is uncertain. By managing a portion of the Sunkhaze Meadows Unit as early successional forest, we could ensure a sizeable area of this habitat to support breeding and migratory bird populations dependent on this habitat type.

Benton Unit, Sandy Stream Unit, and Carlton Pond WPA are all surrounded by a matrix of privately owned lands with residential homes, agricultural use, and privately managed forests. As highlighted in chapter 1, the Benton and Sandy Stream Units are located within the Unity Wetlands Focus Area. Carlton Pond WPA is located north and east of Unity Pond, just outside of the Unity Wetlands Focus Area. This focus area targets land protection and conservation activities across a range of non-governmental organizations, State, and Federal partners.

Habitat conversions identified for Benton Unit under alternatives B and C would have little consequence on regional populations of species of conservation concern. Under alternative B, the potential conversion of 22 acres of forest to grassland would help create larger grassland area unbroken by trees and shrubs. This would benefit some grassland-dependent species and could potentially result in a few additional species utilizing this habitat type on this unit. The conversion of Benton Unit grasslands to shrublands under alternative C would eliminate all grassland bird use, but instead promote use by species dependent on early successional young forest and shrubland habitats. Again, the overall size of this conversion would have little consequence on regional populations, but would help the refuge improve its efforts in providing beneficial habitat.

All of the proposed alternatives would maintain or improve biological resources on Service-owned lands. The long-term land protection and management activities proposed under all alternatives would complement other neighboring conservation efforts by the State, TNC, Friends of Unity Wetlands, and other organizations. Cumulatively, these large areas of protected lands provide many acres of protected lands for a variety of species.

The extent and type of improvement at the refuge and WPA would vary depending on the final selected alternative. The combination of our management actions with partner actions could result in beneficial cumulative effects by continuing protection of listed threatened and endangered species and other species of concern and their associated habitats, through habitat preservation, management, or in some cases proposed conversion. In particular, we target migrating waterfowl, forest dwelling landbirds, breeding marshbirds, bald eagles, and songbirds. Less than 90 nesting pairs of black tern are known to occur within Maine. Our ongoing habitat management would continue to support Federal and State listed species, including the black tern, which consistently nests at Carlton Pond WPA. We will also continue to provide habitat for many species noted in chapter 2 as rare or declining. Although, for most species, we do not

support as large of a contribution to the regional population as we do with black tern. Ongoing invasive species monitoring and control efforts would limit the spread of exotic species. Over the life of this CCP, we would use a combination of adaptive management and the best science available to manage important habitats, prevent and control invasive species, and promote regionally significant natural communities.

Under each alternative, we would continue to allow activities that result in the direct loss of individual wildlife, such as hunting, fishing, and furbearer management (trapping). While hunting and fishing fall under the priority public use category, we authorize trapping as a management tool. As highlighted in chapter 2, many mammal populations are thought to be stable or increasing. One exception is white-tailed deer, which are at the northern extent of their range near the refuge. Deer populations have slowly declined in recent years. Along with this decline, there has been a corresponding decline in deer harvest numbers. Participation in hunting and furbearer management activities at the refuge and WPA are relatively low. Therefore, we do not expect impacts to these species as a result of allowing these activities. We describe the site-specific impacts of these programs earlier in this chapter and in appendix B, Findings of Appropriateness and Compatibility Determinations. Hunting, trapping, and fishing would not have a significant cumulative impact on the overall species taken. The refuge does not have jurisdiction over WPA waters, only access to them. All of these activities rely on locally reproducing populations and their take would not comprise a regional impact. No cumulative impacts are expected.

Cumulative Impacts on the Socioeconomic Environment

As described earlier, the area surrounding Sunkhaze Meadows NWR and Carlton Pond WPA is largely rural. Land in the vicinity of the Sunkhaze Meadows Unit is almost entirely forested, while areas near the Benton and Sandy Stream Units and Carlton Pond WPA are in agricultural or residential use. Population growth in the counties surrounding the refuge and WPA has historically been low, with a three or four percent increase over the past decade. Despite the rural landscape and historic trend, the lower Penobscot River watershed ranks number one in the nation for projected housing density increases, more than 310,000 acres of its surface area are predicted to be developed in the next three decades (Stein et al. 2005). Economically, the median income of the counties surrounding the refuge and WPA is slightly lower than the national average, yet close to the median income for Maine.

We expect none of the proposed alternatives to have a significant adverse cumulative impact on the economies of the town or counties surrounding Sunkhaze Meadows NWR and Carlton Pond WPA. None of the alternatives alter the demographic or economic characteristics of the local community. We expect a small, but net benefit to the adjacent communities by providing and promoting a natural setting for solitude, connection with nature, and outdoor recreation opportunities.

Under all of the alternatives, the actions we propose would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. Regardless of which alternative we select, we would continue to pay refuge revenue sharing payments to the communities where the refuge units and WPA are located. However, recent payments to local

governments have not equaled losses in tax revenue, and we expect these payments to have negligible effect on the local governments' budgets.

Fully funding the additional staffing in alternatives B and C would create a small, incremental contribution to the employment and income in the local community. With increased staffing and more emphasis on environmental education, interpretation, and wildlife observation, we expect public use of Service-owned lands to increase. This outcome would increase the number of visits and time spent in the area. Correspondingly, the level of visitor spending is expected to increase in the communities surrounding refuge units.

Our existing and expanding partnerships with local, State, Tribal, and Federal entities around the region are key to successful conservation outcomes and building public understanding and support for this work. With onsite staffing proposed under alternatives B and C, we would be more responsive to our partners, visitors, local communities, schools, and colleges, and others interested Sunkhaze Meadows NWR and Carlton Pond WPA. Under all of the alternatives, we would continue to provide all priority public uses on Service-owned lands.

The proposed conversion of 92 acres of grassland to shrubland under alternative C would result in a small negative economic impact to the local individual farmer who currently mows the existing grassland under a special use permit for haying. Cumulatively, we expect this negative impact to be somewhat offset on a regional scale by the increased visitation anticipated and the associated expenditures by Service staff and visitors.

Cumulative Impacts on the Cultural and Historical Environment

As noted, a number of cultural or historic resources have been identified on Service-owned refuge and WPA lands, and it is likely others are present (Robinson 2012; Spiess, Maine Historic Preservation Commission personal communication 2011). These resources are part of a larger landscape of cultural or historic resources identified along the large river corridors of south and central Maine. We would continue to work with our regional archaeologists and consult with our Regional Archaeologists, the Maine Historic Preservation Commission, and other parties as appropriate to ensure compliance with NHPA and other applicable laws and regulations.

We expect none of the alternatives to have significant adverse cumulative impacts on cultural resources on Service-owned lands or on regional resources surrounding refuge and WPA lands. Our protection of these resources complements the protection efforts being undertaken by State and non-governmental partners on surrounding lands. Depending on the alternative, beneficial effects would vary, because of the changes proposed in habitat management and expected increases in public use. Alternatives B and C would both increase the amount of cultural and historic resource interpretation integrated into environmental education and interpretation. As a result, we would expect a small beneficial increase in awareness and appreciation of these resources under these alternatives.

Cumulative Impacts Related to Climate Change

Department of the Interior Secretarial Order 3226 (January 16, 2009) states that "there is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision-making. This order ensures that climate change

impacts are taken into account in connection with Departmental planning and decision-making." Additionally, it calls for the incorporation of climate change considerations into long-term planning documents, such as this CCP.

The Manomet Center for Conservation Sciences has prepared a report (Whitman et al. 2010) summarizing climate change predictions and their potential impacts on biodiversity for Maine. This report notes several habitat types found on Service-owned lands that are likely to be most susceptible to impacts resulting from anticipated climate change. Aquatic habitats, including coldwater rivers and streams, ephemeral wetlands, and peatlands are expected to be greatly affected by temperature increases and changes in hydrology. A gradual warming trend may cause some cold water streams to become transitional cool or warm water systems. Coniferous forests, including boreal forest types dominated by spruce and eastern hemlock, may be greatly affected by increases in air temperature and by resulting climate-induced outbreaks of pest species. Changes in temperature and increased invasions by pests (both aquatic and land-based) can alter species communities, displace individual plants and animals, and (in extreme cases) eventually lead to localized extinction of species.

The Service is taking a major role among Federal agencies in distributing and interpreting information on climate change. There is a Web site dedicated to this issue at: *http://www.fws.gov/home/climatechange/* (accessed March 2012), which links to the Service's recently released Strategic Plan for Climate Change. Strategies for adapting to climate change are included in this CCP (USFWS 2010). The plan employs three key strategies to address climate change: adaptation, mitigation, and engagement. Under the preferred alternative presented in this CCP, we would implement a variety of habitat monitoring activities that rely on ecological integrity indices and other protocols that together would help us identify long-term trends and changes in habitats and species use associated with management and climate change. The Association of Fish and Wildlife Agencies developed guidance for states as they update and implement their respective wildlife action plans (AFWA 2009). This publication also includes strategies that would help conserve fish and wildlife species and their habitats and ecosystems as climate conditions change. The broad spatial and temporal scales associated with climate change suggest that management efforts that are coordinated on at least the regional scale would likely lead to greater success. In addition, we would continue to rely on the habitat and species vulnerability assessments and other climate change research developed by the Northeast Climate Impacts Assessment and the Manomet Center for Conservation Science.

In considering climate change impacts and developing corresponding strategies within this CCP, we would address objective 2.4 highlighted in the Service's Strategic Plan for Climate Change: incorporate climate change in Service activities and decisions. We also address several other objectives through specific actions proposed within this plan. The Wildlife Society (TWS) also published a technical review report in 2004 titled "Global Climate Change and Wildlife in North America" (Inkley et al. 2004). The TWS report provides 18 recommendations to assist land and resource managers in meeting the challenges of climate change when working to conserve wildlife resources (Inkley et al. 2004). Their position is that if land and resource managers collectively implement these recommendations, then cumulatively there would be a positive impact of addressing climate change. Some of the 18 recommendations are not directly applicable to the management of habitats at Sunkhaze Meadows NWR and Carlton Pond WPA.

As such, we discuss our actions relative to addressing some of the pertinent recommendations of the TWS technical report and Service's strategic plan:

Adaptation and Management for Diverse or Changing Conditions

The habitat management actions described in chapter 3 are intended to promote healthy, functioning native habitats, to protect biological integrity, and maintain the resiliency within these systems to adapt to changing conditions. In its Strategic Plan for Climate Change, the Service recognizes four basic strategies, to climate change adaptation for fish and wildlife resources (based on Millar et al. 2007): resistance, resilience, response, and realignment (USFWS 2010). These strategies are effectively met if we apply our principles of adaptive management whereby we identify the conservation need, deliver the needed action, evaluate the responses to our actions, and realign our management with our monitoring's findings. We intend to implement an adaptive management approach as new information becomes available and our inventory and monitoring actions inform us of changes occurring. Adaptive management requires understanding and baseline data on the refuge and WPA habitats and their species use. Currently, Sunkhaze Meadows NWR and Carlton Pond WPA have very little inventory and monitoring history. Rising to the challenges of climate change and implementation of adaptive management first requires baseline understanding of what the refuge supports, when, and through what contributions. To obtain this information, we propose a series of inventory and monitoring efforts at various refuge units and the WPA to undertake this important first step.

Reduce Nonclimate Stressors on the Ecosystem

This recommendation, cited by both TWS and the Service, is intended to help species and habitats maintain better resiliency and adaptation against a changing climate. The objectives of our habitat management program are to maintain and enhance the ecological integrity and biological potential on Service-owned lands. Objectives to preserve and manage habitats for native vegetation would help maintain resilience against changes posed by climate change. All alternatives support this recommendation by maintaining ecological function and natural processes.

Maintain Healthy, Connected, Genetically Diverse Populations

Both TWS and the Service highlight the importance of maintaining large expanses and connected habitats. Small isolated populations are more prone to extirpations than larger, healthy, more widespread populations. Larger tracts of protected land facilitate more robust species populations and can offer better habitat quality in core areas. We would continue to work with our partners at the local, State, Tribal, and university levels to support population inventory and monitoring, and complement our management efforts focused on maintaining and enhancing exemplary natural communities and rare, threatened, and endangered species. Under all alternatives, we would coordinate with other conservation lands and promoting connectivity between area conservation lands as resources allow.

Seavy et al. (2009) highlights the benefits of riparian preservation and restoration and its contribution to migration and connectivity corridors for plants, fish, and wildlife species adjusting to climate change. Under all alternatives we maintain wide natural corridors over land and along waterways to help aid in the connectivity of habitats. In addition, riparian forest expansions promoted under alternatives B and C improve our ability to support these connection

corridors across the surrounding landscape of all refuge units and the WPA. Cumulatively, our proposed actions maintain and enhance connectivity benefits on and adjacent to Service-owned lands.

Prevent and Control Invasive Species

Climate change may increase opportunities for invasive species to spread, because of their adaptability to disturbance (Inkley et al. 2009; USFWS 2010). Invasive species prevention and control would be essential, including extensive monitoring and control to ensure early detection and rapid response. Invasive species control is a major initiative within the Service (USFWS 2010). In chapter 2, we describe the current extent of invasive species on Service-owned lands, and in chapter 3 we include strategies common to all alternatives for controlling existing and potential invasive plant infestations. Following approval of the CCP, the refuge and WPA will complete an inventory and monitoring plan that would describe monitoring and inventorying strategies to protect against any new infestations.

Select and Manage Conservation Areas Appropriately

The establishment of refuges, parks, and reserves is used as a conservation strategy to try to minimize the decline of wildlife and habitats in North America. Decisions on locating and managing future conservation areas should take into account potential climate change and variability. We would continue to work with our conservation partners to identify and protect areas that maintain connectivity and biological integrity in the face of climate change and other stressors.

Ensure Ecosystem Processes

Managers may need to enhance or replace diminished or lost ecosystem processes. Manually dispersing seed, reintroducing pollinators, and treating invasive plants and pests are examples of some ways managers can restore or enhance ecological processes. Our habitat goals and associated objectives under alternative all alternatives include an emphasis on preserving and maintaining ecological processes associated primarily with the peatland-wetland complex and late successional forests on refuge and WPA lands. Alternative A does not include any additional inventory or monitoring actions that might help us better understand these complex processes. Alternative C would address much of the same need, but would alter a significant portion of late successional forest to a more transitional early successional forest habitat. Alternative B focuses instead on preserving and maintaining these ecological systems and improving connectivity and our understanding of these systems through adaptive management.

Use Monitoring and Adaptive Management

Managers should monitor climate and its effects on wildlife and their habitats and use this information to adjust management techniques and strategies. Given the uncertainty with climate change and its impacts on the environment, relying on traditional methods of management may become less effective. We agree that an effective and well-planned monitoring program, coupled with an adaptive management approach, would be essential to dealing with the future uncertainty of climate change. We have built both aspects into alternatives B and C of this draft CCP and EA. Under all of the alternatives, we would develop a detailed step-down inventory and monitoring plan designed to test our assumptions and management effectiveness as resources

allow. Under all of the alternatives, we intend to use that information to either adapt our management techniques, or reevaluate or refine our objectives as needed.

Unavoidable Adverse Effects

Unavoidable adverse effects are the effects of those actions that could cause harm to the human environment and that cannot be avoided, even with mitigation measures. All of the alternatives would result, to some extent, in minor, localized, unavoidable adverse effects. For example, small construction projects for new parking areas, and boardwalks or signs at Sunkhaze Meadows Unit would produce minor, short-term, localized, adverse effects by removing native vegetation, compacting soils, and disturbing habitat in the project areas. Increased visitation could also have minor unavoidable effects.

Aspects of proposed habitat management would potentially have unavoidable adverse effects as a result of vegetation and soil disturbance. In alternative B, the conversion of 22 acres at the Benton Unit to grassland (if implemented) would result in unavoidable loss of forest habitat, large woody native vegetation, and soil compaction across portions of this area where heavy equipment is used to help clear vegetation. Similarly, clearing of trees across 715 acres at Sunkhaze Meadows Unit under alternative C would also cause unavoidable loss of forest habitat, removal of large woody native vegetation, and create soil compaction. These are small areas compared to the refuge, local, and regional landscapes and we would work to minimize these adverse effects where possible. For example, the 715 acres proposed for young forest management under alternative C include areas that have previously been cleared and are along edges of the current forested habitat. This minimizes loss of existing, mature forest as well as forest fragmentation. We do not believe that any of these effects would rise to a significant level.

Some aspects of wildlife-dependent recreation, such as hunting or fishing, would result in the unavoidable adverse impacts on individual fish and wildlife as a result of providing that activity. However, we would protect populations from adverse effects by requiring all participants follow applicable State and Federal regulations. In addition, we anticipate long-term benefits to species and habitats from connecting people with nature through these activities. In addition, alternatives B and C propose management actions that would result in improved habitat for fisheries and wildlife.

All of these unavoidable adverse effects on the physical and biological environment would be relatively local and more than offset by the long-term benefits for the diversity and ecological health of the broader landscape.

Some impacts on certain individuals or Service neighbors may be unavoidable, but our responsibility is to provide equal opportunities to the American public, not a select few. We believe we have sought a fair balance in minimizing and mitigating adverse impacts while providing quality recreational opportunities to the public. All of what we propose in the arena of public use takes into account opinions expressed during public involvement and input during the planning process.

Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be undone, except perhaps in the extreme long term. One example is an action that contributes to a species' extinction. Once extinct, it can never be replaced and is an irreversible loss. By comparison, irretrievable commitments of resources are those that are lost for an extended period of time, but could be undone given sufficient time and resources, although there may be a loss in productivity or use for a time. An example of an irretrievable commitment is converting what was once a mature forest and actively managing and maintaining it in an early successional forest habitat condition. If, for some reason, that early successional habitat was no longer an objective, those acres could progress gradually to mature forest again over a period of 70 or more years, or we could determine it best to expedite that reversion by planting shrubs and trees and controlling invasive plants.

Some habitat types on the refuge could be adversely affected. In alternative C, for example, we proposed conversion of 715 acres of late successional forest to early successional habitat at the Sunkhaze Meadows Unit and 92 acres of grassland to shrubland at the Benton Unit. This type of habitat conversion would result in a net loss of late successional forests and grassland that would be unavoidable if those management actions are carried out. By contrast, alternative B has lesser extents of conversion, including 3 acres of grassland converted to late successional forest, and 22 acres of forest potentially converted to grassland at the Benton Unit.

Public use developments proposed under alternatives B and C would result in small localized commitments to infrastructure and their maintenance. Alternatives B and C both propose expansion of trail systems, new parking area, and updated signs and kiosks. Cumulatively, these small improvements would require commitment of occasional resource and staff investment to implement and maintain.

Environmental Justice

President Clinton signed Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directs Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high, adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities' access to public information and participation in matters relating to human health or the environment.

We expect none of the three proposed alternatives to have significant adverse cumulative impacts on the economy of the towns or counties in which refuge lies. We would expect none of the alternatives to alter the demographic or economic characteristics of the local community. The actions we propose would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. All of the alternatives would maintain the existing landscape. Consequently, no adverse impacts would be expected including changes in the community character or demographic composition.

Overall, we expect none of the alternatives would place a disproportionately high, adverse environmental, economic, social, or health effects on minority or low-income persons. Our programs and facilities are open to all who are willing to adhere to the established refuge rules and regulations, we acquire land only from willing sellers, and we do not discriminate in our responses for technical assistance in managing private lands.

Summary of Environmental Consequences by Alternative

Table 4.2. A Summary of the Foreseeable Consequences of Each Alternative.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
Air Quality	Land management would continue to provide direct and cumulative benefits to air quality by maintaining natural vegetative cover on up to 11,876 acres at Sunkhaze Meadows NWR and 1,068 acres at Carlton Pond WPA. Limiting public uses to those found to be appropriate and compatible would also continue to benefit air quality by limiting emissions associated with uncontrolled visitation.	Same as alternative A.	Same as alternative A.
	Refuge and WPA land protection would sustain long-term plant growth that would have a small benefit in sequestering carbon and reducing greenhouse gases.	Long-term benefits for air filtering and carbon sequestration from land protection would be similar to those in alternative A.	Long-term benefits for air filtering and carbon sequestration from land protection and management would be similar to those in alternatives A and B.
	Alternative A would include fewer ground-disturbing and management activities that would introduce additional short-term emission sources than alternatives B and C.	Construction activities involved in land management and expanding visitor service infrastructure would cause short-term, localized adverse impacts from construction vehicles and equipment exhausts would occur.	Short-term impacts due to construction emissions would be similar to alternative B.
	The regional vehicle emissions resulting from approximately 6,300 visits to Service-owned lands and WPA lands would continue to be negligible in comparison to ambient air quality and emission from the surrounding region.	Expanding refuge programs and improving facilities is expected to increase visitation modestly. A marginal increase in local vehicle emissions would result from the increase in visitation, but it would be negligible in comparison to ambient air quality and emissions associated with land uses surrounding Service-owned lands.	Air quality impacts would be similar to those described under alternative B, except an increase in visitation would be slightly greater (5 percent) than alternative B.
	Under all of the alternatives, synthetic sources of emissions from refuge activities and visitor vehicles are negligible compared to emissions associated with the variety of land uses around the Bangor and Milford-Orono region and adjacent highways. There are no major stationary or mobile sources of air pollution present on Service-owned lands nor would any be created under any of the alternatives. Adverse impacts are not expected to exceed Federal Clean Air Act air quality standards. No Class I air quality areas would be affected.		

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
Hydrology and Water Quality	Long-term benefits for hydrology and water quality would result from protecting streams and other open waters within the approved Service land boundaries. Some negligible risks to water quality from herbicide use in conjunction with invasive plant management. That impact is minimized by using only approved herbicides, having a spill plan, and using the herbicide as instructed by the manufacturer and refuge policy.	Overall impacts would be the similar as for alternative A, except: Increasing the forested riparian buffer width at Sandy Stream Unit to a minimum of 90 feet would help improve water quality protection through additional shading and buffering effects.	Overall impacts would be the same as for alternative B.
	None of our proposed management activities should adversely affect local or regional hydrology and water quality. None would violate Federal or State standards for contributing pollutants to water sources; all three would comply with the Clean Water Act.		
Soils	Long-term benefits for soils from protecting lands within the approved Service land boundaries.	Long-term benefits for soils from land protection would be similar to alternative A.	Long-term benefits for soils from land protection would be similar to alternative A.
	Minor soil displacement and loss may result from public use and land management activities.	Short-term soil compaction and erosion from trail maintenance crews and refuge visitors, but impact area limited to existing trails. Closure of two Buzzy Brook Trails would reduce the long-term impact to soils by limiting access in this portion of Service-owned lands.	Same as alternative B, except the Buzzy Brook Trails would remain open and receive regular maintenance. This would increase the potential for additional localized soil compaction and erosion.
	No added trails would prevent impacts to soils.	Construction of a 1.4-mile long connector trail near Carter Meadow Road would result in limited and localized soil disturbance during construction.	Same as alternative B.
	Visitation could potentially result in localized soil compaction or erosion. Service staff would monitor trails to evaluate ongoing impacts and needs to minimize impacts.	Increased visitation under alternative B could result in increased potential for soil compaction and erosion along trails and other access areas. Service staff would monitor trails and access areas to evaluate any impacts as a result of increased use.	Similar to alternative B, except the 5 percent additional increase in visitation compared to alternative B could have a increase the potential for compaction and erosion.
Vegetation	Continue to have minimal coordination with the electric utility companies in regards to right-of-way maintenance.	The Service would work with the electric utility companies to selectively manage the 107-acre transmission line right-of-way to periodically clear tall-growing woody vegetation in order to maintain line	Same as alternative B.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
		clearances required by the Federal Energy Regulatory Commission, and to maintain lower-growing shrub cover for migratory and breeding bird habitat.	
	The current lack of staff would continue to inhibit our ability to assess and manage forests on the refuge and WPA.	Continue to manage forests with a focus on promoting late successional forest vegetation on the refuge and WPA.	Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest to early successional shrub and sapling vegetation.
	The current lack of staff would continue to inhibit our ability to assess and manage the white cedar woodland fen.	Increased management of the white cedar woodland fen would maintain and/or increase this vegetation cover at Sunkhaze Meadows Unit.	Same as alternative B.
	The current lack of staff would continue to inhibit our ability to assess and understand the management needs for forests on the refuge and WPA.	Conducting a forest health and condition assessment at Sunkhaze Meadows Unit, Benton Unit, and Carlton Pond WPA would increase our understanding and management of mixed hardwood forest vegetation on Service-owned lands.	Same as alternative B.
	Existing grassland areas would remain in place as a result of our annual haying agreement and occasional prescribed burning.	At the Benton Unit, ongoing grassland management would augment the existing mowing regime and focus on increasing native species diversity and improving grassland habitat through invasive species control and prescribed burning. This more intensive management would likely improve the species diversity and grassland bird nesting opportunities within Benton Unit's grassland.	Conversion of 95 acres of grassland to shrubland at the Benton Unit would result in the removal of most of the grassland habitat at this unit.
	Continue to mow the 3-acre patch of grassland along the northern boundary of the Benton Unit.	Conversion of 3 acres of grasslands to forested vegetation at the Benton Unit would result in a slight reduction of grassland habitat and a corresponding increase in forested cover.	Same as alternative B.
	The 22-acres of northern hardwoods-mixed forest within the central portion of the Benton Unit would continue to be supported through minimal management.	The potential conversion of 22 acres (if determined appropriate by staff and site conditions) of northern hardwoods-mixed forest at the Benton Unit would convert this area from forest to a wet-mesic grassland vegetation type.	Same as alternative A.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	No expansion of the riparian forest would result in maintaining shrub and grass cover.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit by ceasing mowing would result in approximately 2 acres of grassland being converted to forest vegetation.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit through planting would result in approximately 2 acres of grassland being converted to forest vegetation. Compared to alternative B, there would be slightly higher maintenance required to ensure plantings success and survival.
	The current snowmobile trail would continue to bisect the Sandy stream Unit and fragment the vegetative cover.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of vegetative cover.	Same as alternative B.
	No additional infrastructure would limit impacts to vegetation.	Infrastructure construction projects, such as boardwalks and kiosk or signage installation, would result in small-scale and localized loss of vegetation.	Same as alternative B.
	Current use would have a minimal impact on the compaction and trampling of vegetation.	A modest increase in visitation over alternative A could potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. Service staff would monitor usage to prevent or correct any unauthorized off trail use.	An additional 5 percent increase in visitation over alternative B could potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. Service staff would monitor usage to prevent or correct any unauthorized off trail use.
	Long-term preservation of forested habitat, conservation of high-quality bog and wetland habitat at Sunkhaze Meadows Unit and Carlton Pond WPA would be maintained over the life of the CCP. The 107-acre electric utility transmission line right-of-way would periodically be cleared of all woody vegetation in order to maintain line clearances required by the Federal Energy Regulatory Commission. Preservation of the white cedar woodland fen would maintain and/or result in a slight decrease of this vegetation cover at Sunkhaze Meadows Unit as succession, wind throw, disease, or other impacts affect this cover type. Annual mowing of grasslands at the Benton Unit would result in the temporary removal of biomass as hay vegetation in order to maintain the area as a mix of grass and flowering species.		

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	The mixed assemblage of floodplain forest and shrubland at Sandy Stream would be maintained over the life of the CCP. We would continue to monitor and manage invasive species that cause environmental harm such as decline of native species and disruption of environmental processes. We would continue to employ an integrated pest management approach and adaptive management to control invasive plant species. We would also continue to promote visitor and public awareness of invasive plant species issues which could result in increased management of invasive plant species in the region. Continue education and interpretation of native and invasive vegetation to encourage volunteer based control of invasive species.		
Migratory Birds	Continue to have limited ability to manage for breeding, foraging, and stopover habitat for State-listed and regional priority landbird species as part of refuge wetland, grassland, and forest management.	Same as alternative A.	Long-term preservation of forested habitat at Sunkhaze Meadows Unit and Carlton Pond WPA would be maintained similar to alternative A, plus: Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest to early successional shrub and sapling vegetation, resulting in a 7 percent loss of forested habitat. Creation of early successional areas would also increase the amount of edge habitat within the remaining forested lands. This would result in a net benefit for shrub and edge-nesting species, and a negative impact on late successional forest species.
	Continue to have minimal coordination with the electric utility companies in regards to right-of-way maintenance.	The Service would work with the electric utility companies to selectively manage the 107-acre transmission line right-of-way to periodically clear tall-growing woody vegetation, and to maintain more permanent lower-growing shrub cover for migratory and breeding bird habitat.	Same as alternative B.
	Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs;	A modest potential increase in visitation could add to the potential for occasional migratory bird disturbance.	Same as alternative B, but the additional 5 percent increase over alternative B

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	however, the requirement to stay on trails and on leash would minimize the extent and duration of impacts.		would result in even greater potential for occasional migratory bird disturbance.
	The existing 95 acres of grassland would continue to provide marginal grassland bird habitat due to its size and configuration.	The potential conversion of 22 acres (if determined appropriate by staff and site conditions) of northern hardwoods-mixed forest at the Benton Unit would convert this area from forest to a wet-mesic grassland, which could create a more contiguous habitat for nesting grassland birds.	Conversion of 92 acres of grasslands to shrubland habitat at the Benton Unit would result in increased shrubland habitat and a corresponding loss in grassland cover. This is expected to a have an increase in nesting of species that utilize shrublands along with a corresponding loss of grassland bird nesting.
	Continue to maintain the 3-acre patch of grassland near the northern boundary of the Benton Unit.	Conversion of 3 acres of grasslands to forested vegetation at the Benton Unit would result in a slight reduction of grassland habitat and a corresponding increase in forested cover. This is expected to a have a negligible impact on landbird nesting cover.	Same as alternative B.
	The existing riparian forest corridor at the Sandy Stream Unit would continue to provide minimal cover and forage for migrating and nesting birds.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit by ceasing mowing would result in approximately 2 acres of shrubland being converted to forest vegetation, which would provide a minor increase in forested nesting cover in the future.	Same as alternative B.
	The existing snowmobile trail would continue to fragment and limit available habitat.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of available shrub habitat, thereby improving habitat availability for migrating and nesting songbirds.	Same as alternative B.
	We would continue to rely primarily on partners for information regarding species use at the refuge and WPA.	Increased knowledge and understanding of bird populations resulting from various surveys and inventories would help us better quantify effects on birds on Service-owned lands.	Same as alternative B.
	The current low levels of use would continue to have minimal effect on migratory bird use at the refuge and WPA.	Increased visitation could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct	Expanding the trail network for wildlife observation at Benton Unit could potentially result in added off trail usage

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
		any unauthorized off trail use or added disturbance that might influence nesting.	impacts and disturbance as a result of use. Increased visitation (slightly more of an increase over alternative B) could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting.
	Continued forest preservation would maintain mid-to-late successional forest habitat benefitting a variety of raptor, songbird, and other species that utilize forests for migratory stopover and breeding habitat. Habitat for waterfowl, wading birds, shorebirds, and landbirds at Carlton Pond WPA would remain unchanged amongst all alternatives. Periodic clearing of the 107-acre electric utility transmission line right-of-way of vegetation would result in the temporary loss of shrubs and other woody nesting cover, along with a corresponding increase in temporary grassland habitat. The lack the staff would continue to limit our ability to evaluate and monitor Benton Unit grasslands and to modify our management accordingly to better meet wildlife objectives. Our lack of staff limits our ability to monitor nesting birds and habitat conditions across all units of Sunkhaze Meadows NWR and Carlton Pond WPA. Similarly, we would be unable to monitor potential impacts of public use, water level changes, or invasive species. We would continue to coordinate with MDIFW on information sharing and decision-making recommendations to maintain partnerships in protection of State endangered species.		
Fish and Mussels	The lack of staff inhibits our ability to monitor and evaluate the status of fish and freshwater mussel resources on the refuge and WPA.	Staffing would allow us to improve our monitoring and evaluation of fish and freshwater mussels on the refuge and WPA. This increased knowledge would help us improve our management for these resources.	Same as alternative B.
	The current riparian forest buffer at the Sandy Stream Unit would continue to provide minimal benefits to Sandy Stream in terms of soil stabilization and food web inputs.	Expansion of the forested riparian buffer at Sandy Stream Unit would have a small long-term benefit to fish and freshwater mussel resources within Sandy Stream.	Same as alternative B.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	Protection of the existing freshwater wetlands, streams, and other open water areas at Service-owned lands protects and supports a number of aquatic species (see Table 2-10). Continue enforcement against deliberate introductions of nonnative fish, and outreach and education to explain the impacts of those introductions as well as the accidental introductions of invasive plants, pathogens, and exotic, invasive invertebrates. Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat primarily for warmwater and, to a lesser extent, coldwater fish species. State regulations would be adhered to, which establish species and harvest limits to insure no cumulative impact on any fish populations. Continue to work with the MDIFW on outreach, education and law enforcement related to fisheries.		
Mammals	The current lack of staffing would limit our ability to conduct inventories that would improve our knowledge and understanding of species use on the refuge and WPA.	Increased knowledge and understanding of bird populations resulting from various surveys and inventories would help us better quantify effects on birds on Service-owned lands.	Same as alternative B.
	Maintaining the existing snowmobile route would continue to fragment shrubland habitat at Sandy Stream Unit.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of available shrub habitat, thereby reducing the proximity and intensity of disturbance on overwintering mammals.	Same as alternative B.
	Maintaining 6,906 acres of mature forest at the Sunkhaze Meadows Unit would sustain habitat suitable for forest dwelling mammals.	Same as alternative A.	Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest to early successional shrub and sapling vegetation, resulting in a 7 percent loss of forested habitat. Creation of early successional areas would also increase the amount of edge habitat within the remaining forested lands. This would result in a net benefit for shrub and edge-dwelling species, and a negative impact on forest species.
	The existing combination of grassland and forest would benefit a combination of grassland and edge-dwelling mammals.	The potential conversion of up to 22 acres of forest to grassland at the Benton Unit would increase the size and connectivity of grasslands on site. This would have a net benefit for grassland dwelling mammals.	Conversion of 92 acres of grasslands to shrubland habitat at the Benton Unit would result in increased shrubland habitat and a corresponding loss in

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
			grassland cover. This is expected to a have an increase in utilization by species that inhabit shrublands.
	Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs; however, the requirement to stay on trails and on leash would minimize the extent and duration of impacts.	A modest increase in visitation over alternative A could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting.	Increased visitation (slightly more of an increase over alternative B) could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence mammal behavior.
	Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat for primarily forest and wetland dwelling species, as well as upland grassland and shrubland species. Continue to coordinate with MDIFW on information sharing and decision-making recommendations to maintain partnerships in protection of mammals utilizing Service-owned lands.		
Other Native Wildlife (Amphibians, Reptiles, and Invertebrates)	Land protection and management would continue to provide habitats similar to that noted under common to all alternatives.	In addition to impacts and benefits noted under common to all alternatives, long-term preservation of forested habitat at Sunkhaze Meadows Unit and Carlton Pond WPA would benefit mature forest dwelling species.	Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest habitat to early successional shrub and sapling vegetation, resulting in a 7 percent loss of forested habitat. Creation of early successional areas would also increase the amount of edge habitat within the remaining forested lands. This would likely result in a negative impact on reptile and amphibian species adapted to late successional forest.
	Maintaining the existing riparian forest at the Sand y Stream Unit would provide minimal benefit to species sensitive to riparian corridor alterations.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit by ceasing mowing would result in approximately 3 acres of grassland being converted to forest vegetation. This would provide a minor increase in forested riparian cover in the future	Same as alternative B.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
		benefitting species sensitive to changes in riparian corridors such as wood frogs, eastern red-backed salamanders, and spotted salamanders	
	Maintaining the current grassland and forest would sustain a mix of habitat for reptile and amphibian use at the Benton Unit.	Conversion of 3 acres of grasslands to forest and potentially 22 acres of forest to grassland vegetation at the Benton Unit would result in a slight increase of grassland habitat and a corresponding reduction in forested cover. This is expected to a have a negligible impact on reptile and amphibian use.	Conversion of 92 acres of grasslands to early successional habitat at the Benton Unit would result in increased shrubland habitat and a corresponding loss in grassland cover. This is expected to a have an increase in utilization by species that inhabit shrublands along with a corresponding loss of grassland species.
	Maintaining the existing snowmobile route would continue to fragment shrubland habitat at Sandy Stream Unit.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of available shrub habitat. Increased connectivity would improve habitat conditions and use by amphibians (Cushman 2005).	Same as alternative B.
	The current lack of staffing would limit our ability to conduct inventories that would improve our knowledge and understanding of species use on the refuge and WPA.	Increased knowledge and understanding of reptile, amphibian, and invertebrate populations resulting from various surveys and inventories would help us better quantify effects on species utilizing Service-owned lands.	Same as alternative B.
	Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs; however, the requirement to stay on trails and on leash would minimize the extent and duration of impacts.	A modest increase in visitation over alternative A could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence breeding.	Increased visitation (slightly more when compared to alternative B) could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence breeding.
	Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat for primarily forest and wetland dwelling species, as well as stream and open water associated species. Under all alternatives we would continue to monitor and manage invasive species that cause environmental harm such as decline of native species and		

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	disruption of environmental processes. The use of herbicides to complete aspects of invasive species management can cause negative impacts to some invertebrates. However, our attempts to minimize use and application of integrated pest management techniques should minimize any impact on invertebrate populations. The preservation of native plants as a result of our land management would sustain vegetation diversity, which in turn would likely improve available habitat for invertebrates. This would continue to sustain State special concern reptile and amphibian species through protection of hibernation, foraging, and breeding habitat.		
Federal Endangered and Threatened Species, including Recently De-listed Species	The low level of public use would continue to have minimal impact on federally listed species on the refuge and WPA.	A modest increase in visitation could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting.	Same as alternative B, except for the added potential for impacts resulting in an additional 5 percent in visitation over alternative B and potential for impacts to nesting eagles from added month of coyote season.
	Under all the alternatives, the Service would work to maintain water quality in Sunkhaze Stream and maintain the aquatic and riparian habitats in and along Sunkhaze Stream and its tributaries to sustain conditions for Atlantic salmon and American eel. Continue to maintain nesting and foraging habitat for bald eagles. We would continue to implement public access restrictions to protect the nesting bald eagles through closure of the nesting sites as necessary. We would continue to coordinate with MDIFW on information sharing and decision-making recommendations to maintain partnerships in protection of endangered species.		
Public Use and Access	The ongoing lack of staffing would limit our ability to maintain and update public access infrastructure.	Increased opportunities for wildlife observation would result from providing additional fishing access points and boardwalks, increasing trail maintenance on remaining trails, and construction of a new trail near Carter Meadow Road.	Same as alternative B.
	North and South Buzzy Brook Trails (3.0 miles and 2.4 miles, respectively) would become increasingly inaccessible as vegetation continues to inhibit trail access.	North and South Buzzy Brook Trails would be closed due to difficulty of ongoing maintenance, resulting in a loss of 5.4 miles of trail.	Benefits would result from keeping the two Buzzy Brook Trails open, which would maintain the current number and miles of trails available to visitors.
	Maintain State seasons for hunting on all refuge and WPA lands, except for the refuge-specific shortened coyote season.	Same as alternative A.	Benefits to hunters would result from expanding the coyote hunting season an extra month on Service-owned lands.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
			Adverse impacts to other priority public uses could result from conflicts from the expanded coyote hunting season.
	Continue to not promote commercial guiding as an allowed use on refuge and WPA lands.	Allowing commercial guiding under a special use permit would potentially result in increased public access.	Same as alternative B.
	Continue to allow pedestrian access off trail and along the existing snowmobile trail at the Benton Unit.	Increased opportunities for wildlife observation and interpretation at Benton Unit would result from creating a connector trail to link the parking lot and the existing snowmobile trail. Benefits would result for the public from staff regularly updating and improving refuge interpretation infrastructure.	Benefits would result from adding approximately two miles of new trail at the Benton Unit, providing more opportunities for that area's use for wildlife observation and interpretive purposes and increased visitation to Benton Unit more than under alternative B.
	Continue to rely exclusively on partners for implementation of interpretive programming at the refuge and WPA.	Additional benefits would result from improved public use programming, as well as wildlife-dependent recreation and interpretive opportunities from expanded partnerships with the Friends of Sunkhaze Meadows, surrounding municipalities, the Penobscot Indian Nation, local schools and universities, and other partners.	Further benefits would result from the expanded partnerships detailed under alternative B, which would include increased programming at Carlton Pond WPA, as well as Benton and Sandy Stream Units, under alternative C. Further opportunities for wildlife observation at the Sunkhaze Meadows Unit would be provided by replacing the Carter Meadow observation deck and increasing trail maintenance.
	Benefits to public use would result from continuing to provide quality, compatible wildlife-dependent recreation opportunities. Continuing to allow the Friends of Sunkhaze Meadows to assist with and develop interpretive programming that uses refuge lands and encourages visitation and improves the public's connection with nature. Potential adverse impacts would result from continuing to limit public use and access in ecologically sensitive areas to the extent necessary for adequate species protection. Bicycling would continue to be restricted only along McLaughlin Road at the Sunkhaze Meadows Unit.		

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
Socioeconomic Environment	Continue to contribute minimally relative to local and much larger Bangor and Milford-Orono area economy, in terms of refuge staff jobs, income, refuge and visitor expenditures, and the purchase of goods and services for refuge activities.	In addition to alternative A, Improving access to and infrastructure for successful wildlife observation, hunting, and fishing would contribute to increased economic benefits to the local economy generated from increased out of town visitors and related expenditures. Upgrade and new construction projects would also contribute to the local economy for labor, materials, and services.	Same as alternative B.
	Continue to meet a substantial level of public demand in providing wildlife-dependent recreational activities, adding to the quality of life of the local community and other recreationists and wildlife enthusiasts in the region.	Additional refuge programs and surrounding population growth would modestly increase visitation compared to alternative A. As a result, local economies would experience minimally increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures.	Additional visitation (slightly more of an increase over alternative B) and an increased focus on expanded interpretive and educational programming would result in increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures as compared to other alternatives.
	Continue to not provide additional environmental education, staff-led interpretation, or wildlife photography opportunities.	Adding four staff specifically for Sunkhaze Meadows and Carlton Pond WPA would increase benefits for the local economy in jobs, income, expenditures, and purchases of goods and services for refuge activities. Staffing and funding would improve our ability to communicate with the community about the values of Service-owned lands and opportunities for recreation under this alternative.	In addition to alternative B, adding two seasonal positions (in addition to four full-time staff as proposed under alternative B) specifically for Sunkhaze Meadows and Carlton Pond WPA would increase benefits for the local economy in jobs, income, expenditures, and purchases of goods and services for Service activities.
	We would continue to maintain existing opportunities for hunting and fishing and not provide any expansion of opportunities.	In addition to alternative A, improvements in infrastructure would benefit access to hunting and fishing opportunities.	Same as alternative B, except that the coyote hunting season would be extended by another month in spring.
	Of the management activities that would not vary by alternative, the following would benefit or adversely affect the socioeconomic environment of Service-owned lands: protecting land, maintaining facilities, supporting research and Friends of Sunkhaze Meadows NWR group activities at Service-owned lands, and implementing existing priority public use opportunities.		

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
Cultural and Historic Resources	Same as common to all alternatives.	Same as alternative A, except ensuring consistent messaging in partner-sponsored interpretive programming would improve our communication of the significance of cultural resources and the importance of their protection and interpretation.	Same as alternative B.
	Rely primarily on partners to organize and implement cultural resource interpretive materials and programming.	Work with the Penobscot Indian Nation to explore opportunities for developing materials and programming to better interpret cultural resources would result in improved interpretive materials and programming and help visitors to gain appreciation for the historic and cultural significance of Service-owned lands and resources within them.	Same as alternative B.
	The current low level of visitation would continue to pose little or no threat to existing cultural or archaeological sites on the refuge and WPA.	An expected increase in visitation to all Service-owned lands is anticipated under alternative B. Increased visitation could potentially result in added off trail usage and disturbance, which could potentially degrade or disturb archaeological and cultural resource sites. Service staff would monitor usage to prevent or correct any unauthorized off trail use that may threaten archaeological and cultural resources.	Same as alternative B.
	Under all alternatives, we would continue to protect the archaeological or cultural resource sites known to be present on Service-owned lands. Several archaeological or cultural resource sites are known on Service-owned lands. There are no known historic structures on Service-owned lands. If we should identify sites eligible for the National Register, we would coordinate their protection with our Regional Archaeologists and the Maine State Historic Preservation Office (SHPO).		

Chapter 5

Leigh Osgood, Friends of Sunkhaze Meadows

Bunchberry and showy lady's slipper at the Sunkhaze Meadows Unit.

Consultation and Coordination

- **Introduction**
- **Planning to Protect Land and Resources**
- **Partners Involved in Refuge Planning**
- **Contact Information**

Introduction

This chapter describes how we engaged others in developing this draft CCP and EA. In chronological order, it details our efforts to encourage the involvement of the public and conservation partners: other Federal and State agencies, Tribes, county officials, civic groups, non-governmental conservation and education organizations, and user groups. It also identifies who contributed in writing the plan or significantly contributed to its contents.

It does not detail the numerous informal discussions the refuge manager and her staff have had over the last year where the CCP was a topic of conversation. Those involved a wide range of audiences, including local community leaders and other residents, refuge neighbors, refuge visitors, and other interested individuals. During those discussions, the refuge manager and her staff often would provide an update on our progress and encourage comments and other participation.

A 30-day period for public review follows our release of this draft CCP and EA. We encourage you to respond with your ideas about the plan. During that period, we will host open-house public meetings at locations near the refuge units and WPA to gather opinions and answer questions about our proposals. We will weigh public responses carefully before we finalize the CCP.

According to Service policy, we must review and update our final CCP at least once every 15 years. We may update the plan sooner, if we determine that we might need to markedly change management direction or, if the Service's Director or our Regional Director deem it necessary. If so, we will publicly announce our intent to revise the plan encourage your participation.

Planning to Protect Land and Resources

January 2011
On January 26, 2011, a conference call was held between refuge staff, regional office staff, and contractors to identify data needs, obtain input on the contact database, discuss the initial newsletter, review the CCP process, and discuss agenda and logistics for the kick-off meeting.

February 2011
Our pre-planning activities in February included a two day kick-off meeting held at the Maine Coastal Islands National Wildlife Refuge (NWR) office on February 8 and 9, 2011.

March 2011
On March 7, 2011, the refuge manager emailed 29 local, county, State, and Federal agency contacts with an invitation to an agency partner scoping meeting. A follow-up reminder email was sent to this same group of contacts on March 17, 2011.

On March 18, 2011, the NOI was published in the Federal Register, officially announcing the beginning of public scoping for the Sunkhaze Meadows NWR and Carlton Pond WPA CCP. The project planning Web site and the refuge Web site were also updated at this time.

On March 23, 2011, the core team contacted approximately 394 contacts included in the planning contacts database compiled for the CCP. The refuge manager emailed 44 of those contacts and invited them to participate in our scoping process, attend our public open houses in April, and included an electronic copy of the scoping newsletter. The remaining 350 contacts were mailed copies of the scoping newsletter containing a similar invitation to participate.

On March 24, 2011, the core team held our agency scoping workshop at the Maine Department of Inland Fisheries and Wildlife, Bangor Research Office. The workshop was attended by six representatives from municipal, State, and Federal agencies. Refuge and planning team staff were also in attendance at the meeting.

April 2011
Two public scoping meetings were held on April 12, 2011, in Milford, Maine at the Milford Town Hall from 2:00 to 4:00 PM and another session at 6:00 to 8:00 PM. A third public scoping meeting was held in Unity, Maine, at the Unity College on April 13, 2011. On April 30, 2011, the official comment period for initial scoping of CCP issues identification ended.

May through December 2011
The core planning team spent the next several months developing alternatives, completing and compiling appendices, and writing and editing the various chapters included within the draft CCP and EA.

December 2011 through February 2012
In December 2011, we initiated outreach efforts to obtain additional information about public uses of the refuge and public comment on potential wilderness designation at the Sunkhaze Meadows Unit.

In January 2012, we developed a newsletter and sent it to approximately 452 individuals and organizations included in the planning contacts database compiled for the CCP. The refuge manager emailed 112 of those contacts an electronic version of the newsletter which explained what designated wilderness is under the Wilderness Act. The newsletter also invited interested parties to attend a public meeting at 6:30 PM on February 9, 2012, in Milford, Maine. We invited the remaining 340 contacts to participate by mailing them copies of the newsletter. On February 9, 2012, we held a public meeting to solicit public input on existing public uses of the refuge and the potential for designating wilderness at the Sunkhaze Meadows Unit.

March 2012 through Spring 2013
Following January 2012 meeting, the Service reviewed and considered comments received and determined not to pursue special designations at the Sunkhaze Meadows Unit. In early August 2012, the Service distributed a newsletter updating the public on the Service's decision not to pursue a wilderness area designation as well as update interested contacts on the status of the CCP process. This newsletter was distributed to the same 452 contacts noted in the January 2012 newsletter distribution.

On September 18, 2012, the refuge manager presented an update on the CCP process and status, as well as findings of the Wild and Scenic Rivers review, to the town of Milford selectmen at their monthly meeting. The Service also prepared another CCP update newsletter that was released in the weeks following this meeting.

Throughout the fall and winter of 2012, the Service finalized alternatives and analyzed impacts for the draft CCP and EA. This document was released for public review and comment in Spring 2013.

Partners Involved in Refuge and WPA Planning

Refuge programs enjoy a great deal of support from outside the Service in many areas: conducting biological surveys, enhancing public use and refuge programs, restoring habitat, and protecting land. Our partnerships will continue to expand under the increasing interest in conserving refuge resources. Since January 2011, we have contacted the following partners to apprise them of the planning process and encourage their involvement.

American Rivers
Aroostook Band of Micmacs
Atlantic Salmon Federationh
Country Cousins Snowmobile Club
Ellsworth American
Forest Society of Maine
Friends of Sunkhaze Meadows
G and G Trailblazers Snowmobile Club
Houlton Band of Maliseet Indians
Kennebec Messalonskee Trails
Maine Cooperative Fish and Wildlife Research Unit
Maine Department of Conservation
Maine Department of Environmental Protection
Maine Department of Inland Fisheries & Wildlife
Maine Retriever Trial Club, Inc.
Maine Sportsman, The
Marine Audubon
Natural Resources Council of Maine
Northern Research Station - Penobscot Experimental Forest
Northwestern University
Passamaquoddy Tribe Indian Township
Penobscot Experimental Forest
Penobscot Indian Nation
Penobscot River Restoration Trust
Pine Tree Snowmobile Club
Pleasant Point - Passamaquoddy
Sebasticook Regional Land Trust
SERC Institute
State Historic Preservation Commission

State of Maine
The Nature Conservancy
The Wilderness Society
Town of Benton
Town of Milford
Town of Unity
Trout Unlimited
Troy Snow Beaters Snowmobile Club
Unity Snow Dusters Snowmobile Club
University of Maine
USDA - Forest Service
U.S. Environmental Protection Agency
U.S. Geological Survey

Contact Information

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	Michael Langlois	*Refuge Biologist*, Maine Coastal Islands NWR Complex, Sunkhaze Meadows NWR, and Carlton Pond WPA.
	Lia McLaughlin	*Natural Resource Planner*, National Wildlife Refuge System, Northeast Regional Office
State Agency Personnel	***Mark Caron***	*Regional Wildlife Biologist*, Maine Department of Inland Fisheries and Wildlife
Tribal Personnel	***Bonnie Newsom***	*Tribal Historic Preservation Officer*, Penobscot Indian Nation Cultural and Historic Preservation Department
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Chapter 6

USFWS

Wild turkeys at Sunkhaze Meadows Unit.

List of Preparers

- **Members of the Core Planning Team**
- **Assistance from Other Service Personnel**

Dan Salas, Cardno JFNew

View of conifer forest along Carter Meadows Road.

Glossary and Acronyms

Glossary

accessibility The state or quality of being easily approached or entered, particularly as it relates to complying with the Americans With Disabilities Act.

accessible facilities Structures accessible for most people with disabilities without assistance; facilities that meet UFAS standards; ADA-accessible [e.g., parking lots, trails, pathways, ramps, picnic and camping areas, restrooms, boating facilities (docks, piers, gangways), fishing facilities, playgrounds, amphitheaters, exhibits, audiovisual programs, and wayside sites].

agricultural land Land now or recently kept as pastures or crops

alternative A reasonable way to fix an identified problem or satisfy a stated need [40 CFR 1500.2] (see "management alternative").

anadromous fish Anadromous fish spend all or part of their adult life in salt water and return to freshwater streams and rivers to spawn.

anthropogenic Caused or produced by humans

appropriate use A proposed or existing use on a refuge that meets at least one of the following three conditions:

1. The use is a wildlife-dependent one;
2. The use contributes to fulfilling the refuge purpose(s), the System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the National Wildlife Refuge System Improvement Act was signed into law; or
3. The use has been determined appropriate as specified in the policy.

approved acquisition boundary A project boundary that the Director of the U.S. Fish and Wildlife Service approves upon completion of the planning and environmental compliance process. An approved acquisition boundary only designates those lands which the Service has authority to acquire or manage through various agreements. The approval of an acquisition boundary does not grant the Service jurisdiction or control over lands within the boundary, and it does not make lands within the refuge boundary part of the National Wildlife Refuge System. Lands do not become part of the System until the Service buys them or they are placed under an agreement that provides for their management as part of the System.

aquatic Growing in, living in, or dependent upon water.

best management practices Land management practices that produce desired results. [Usually describing forestry or agricultural practices effective in reducing non point source pollution, like reseeding skidder trails or not storing wastes in a flood plain. In their broader sense, practices that benefit target species.]

biological diversity or biodiversity The variety of life and its processes and includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

biological integrity Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms and communities.

breeding habitat	Habitat used by migratory birds or other animals during the breeding season.
categorical exclusion	Pursuant to the National Environmental Policy Act (NEPA), a category of Federal agency actions that do not individually or cumulatively have a significant effect on the human environment [40 CFR 1508.4].
community	An assemblage of plants occurring together at any point in time.
community type	A particular assemblage of plants and animals, named for its dominant characteristic.
compatible use	"The term 'compatible use' means a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge."—National Wildlife Refuge System Improvement Act of 1997 [Public Law 105-57; 111 Stat. 1253]
compatibility determination	A required determination for wildlife-dependent recreational uses or any other public uses of a refuge.
comprehensive conservation plan (CCP)	Mandated by the Improvement Act, a document that provides a description of the desired future conditions and long-range guidance for the project leader to accomplish purposes of the refuge system and the refuge. CCPs establish management direction to achieve refuge purposes [P.L. 105-57; FWS Manual 602 FW 1.4].
concern	See "issue."
conservation	Managing natural resources to prevent loss or waste. [n.b. Management actions may include preservation, restoration, and enhancement.]
conservation easement	A legal agreement between a landowner and a land trust (e.g., a private, nonprofit conservation organization) or government agency that permanently limits the uses of a property to protect its conservation values.
cool-season grass	Introduced grass for crop and pastureland that grows in spring and fall and is dormant during hot summer months.
cooperative agreement	A usually long-term habitat protection action, which can be modified by either party, in which no property rights are acquired. Lands under a cooperative agreement do not necessarily become part of the National Wildlife Refuge System.
critical habitat	According to U.S. Federal law, the ecosystems upon which endangered and threatened species depend.
cultural resources	Archaeological sites, historic structures, and historic landscapes.
cultural resource overview	A comprehensive document prepared for a field office that discusses, among other things, project prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement of how program objectives should be met and conflicts resolved. [An overview should reference or incorporate information from a field office's background or literature search described in section VIII of the Cultural Resource Management Handbook (cf. FWS Manual 614 FW 1.7).]

database A collection of data arranged for ease and speed of analysis and retrieval, usually computerized.

degradation The loss of native species and processes due to human activities such that only certain components of the original biodiversity persist, often including significantly altered natural communities.

designated wilderness area An area designated by Congress as part of the National Wilderness Preservation System [FWS Manual 610 FW 1].

digitizing The process of converting maps into geographically referenced electronic files for a geographic information system (GIS).

disturbance Any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment.

donation A citizen or group may wish to give land or interests in land to the Service for the benefit of wildlife. Aside from the cost factor, these acquisitions are no different than any other means of land acquisition. Gifts and donations have the same planning requirements as purchases.

easement An agreement by which landowners give up or sell one of the rights on their property (e.g., landowners may donate rights-of-way across their properties to allow community members access to a river). See “conservation easement.”

ecological processes A complex mix of interactions among animals, plants, and their environment that ensures maintenance of an ecosystem’s full range of biodiversity. Examples include population and predator-prey dynamics, pollination and seed dispersal, nutrient cycling, migration, and dispersal.

ecoregion A territory defined by a combination of biological, social, and geographic criteria, rather than geopolitical considerations; generally, a system of related, interconnected ecosystems.

ecosystem A natural community of organisms interacting with its physical environment, regarded as a unit.

ecotourism Visits to an area that maintains and preserves natural resources as a basis for promoting its economic growth and development.

emergent wetland Wetlands dominated by erect, rooted, herbaceous plants.

endangered species A Federally or State-listed protected species in danger of extinction throughout all or a significant portion of its range.

environmental education Curriculum-based education aimed at producing a citizenry that is knowledgeable about the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward solving them.

environmental health The composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.

Environmental Assessment (EA) A public document that discusses the purpose and need for an action, its alternatives, and provides sufficient evidence and analysis of its impacts to

	determine whether to prepare an environmental impact statement or a finding of no significant impact (q.v.) [cf. 40 CFR 1508.9].
exemplary community type	An outstanding example of a particular community type.
extirpated	Status of a species or population that has completely vanished from a given area but that continues to exist in some other location.
exotic species	A species that is not native to an area and has been introduced intentionally or unintentionally by humans; not all exotics become successfully established.
Federal land	Public land owned by the Federal Government, including national forests, national parks, and national wildlife refuges.
Federally listed species	A species listed either as endangered or threatened under the Endangered Species Act of 1973, as amended.
fee-title acquisition	The acquisition of most or all of the rights to a tract of land; a total transfer of property rights with the formal conveyance of a title. While a fee-title acquisition involves most rights to a property, certain rights may be reserved or not purchased, including water rights, mineral rights, or use reservation (e.g., the ability to continue using the land for a specified time period, such as the remainder of the owner's life).
Finding of No Significant Impact (FONSI)	Supported by an environmental assessment, a document that briefly presents why a Federal action will have no significant effect on the human environment, and for which an environmental impact statement, therefore, will not be prepared [40 CFR 1508.13].
fire regime	The characteristic frequency, intensity, and spatial distribution of natural fires within a given ecoregion or habitat.
floodplain	Flat or nearly flat land that may be submerged by floodwaters; a plain built up or in the process of being built up by stream deposition.
forested land	Land dominated by trees. For impacts analysis in CCP's, we assume all forested land has the potential for occasional harvesting; we assume forested land owned by timber companies is harvested on a more intensive, regular schedule.
forested wetlands	Wetlands dominated by trees.
fragmentation	The disruption of extensive habitats into isolated and small patches. Fragmentation has two negative components for biota: the loss of total habitat area; and, the creation of smaller, more isolated patches of habitat remaining.
geographic information system (GIS)	A computerized system to compile, store, analyze, and display geographically referenced information (e.g., GIS can overlay multiple sets of information on the distribution of a variety of biological and physical features).
grassland	A habitat type with landscapes dominated by grasses and with bio-diversity characterized by species with wide distributions, communities being relatively resilient to short-term disturbances but not to prolonged, intensive burning or grazing. In such systems, larger vertebrates, birds, and invertebrates display extensive movement to track seasonal or patchy resources.

groundwater	Water in the ground that is in the zone of saturation, from which wells and springs and groundwater runoff are supplied.
habitat fragmentation	The breaking up of a specific habitat into isolated and small patches. [n.b. A habitat area that is too small may not provide enough space to maintain a breeding population of the species in question.]
habitat conservation	Protecting an animal or plant habitat to ensure that the use of that habitat by the animal or plant is not altered or reduced.
habitat	The place where a particular type of plant or animal lives. [n.b. An organism's habitat must provide all of the basic requirements for life, and should be free of harmful contaminants.]
historic conditions	The 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.
hydrologic or flow regime	Characteristic fluctuations in river flows.
hydrology	The science of waters of the earth: their occurrences, distributions, and circulations; their physical and chemical properties; and their reactions with the environment, including living beings.
impoundment	A body of water, such as a pond, confined by a dam, dike, floodgate, or other barrier, which is used to collect and store water for future use.
indigenous	Native to an area.
interpretive facilities	Structures that provide information about an event, place, or thing by a variety of means, including printed, audiovisual, or multimedia materials (e.g., kiosks that offer printed materials and audiovisuals, signs, and trail heads).
interpretive materials	Any tool used to provide or clarify information, explain events or things, or increase awareness and understanding of the events or things (e.g., printed materials like brochures, maps or curriculum materials; audio/visual materials like video and audio tapes, films, or slides; and, interactive multimedia materials, CD ROM or other computer technology).
invasive species	A non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
invertebrate	Any animal lacking a backbone or bony segment that encloses the central nerve cord.
issue	Any unsettled matter that requires a management decision (e.g., a Service initiative, an opportunity, a management problem, a threat to the resources of the unit, a conflict in uses, a public concern, or the presence of an undesirable resource condition). [n.b. A CCP should document, describe, and analyze issues even if they cannot be resolved during the planning process (FWS Manual 602 FW 1.4).]
Land Protection Plan (LPP)	A document that identifies and prioritizes lands for potential Service acquisition from a willing seller, and describes other methods of providing protection. Landowners within project boundaries will find this document, which is released with environmental assessments, most useful.

landscape	An aggregate of landforms, together with its biological communities.
management alternative	A set of objectives and the strategies needed to accomplish each objective [FWS Manual 602 FW 1.4.].
management concern	See “issue” and “migratory nongame birds of management concern.”
management opportunity	See “issue.”
management plan	A plan that guides future land management practices on a tract. [N.b. In the context of an environmental impact statement, management plans may be designed to produce additional wildlife habitat along with primary products like timber or agricultural crops (see “cooperative agreement”).]
management strategy	A general approach to meeting unit objectives. [N.b. A strategy may be broad, or it may be detailed enough to guide implementation through specific actions, tasks, and projects (FWS Manual 602 FW 1.4).]
mesic soil	Sandy-to-clay loams containing moisture-retentive organic matter, well-drained (no standing water).
minerotrophic	Areas that receive water primarily from underground or surface sources; has higher nutrient concentrations because the water picks up nutrients as it passes through soil and bedrock, which raises nutrient levels and reduces acidity.
mission statement	A succinct statement of the purpose for which the unit was established; its reason for being.
mitigation	Actions to compensate for the negative effects of a particular project (e.g., wetland mitigation usually restores or enhances a previously damaged wetland or creates a new wetland).
National Environmental Policy Act of 1969 (NEPA)	42 U.S.C. 4321 et seq. requires all Federal agencies to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in planning and implementing environmental actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision-making (cf. 40 CFR 1500).
National Wildlife Refuge System (NWRS, System)	All lands and waters and interests therein administered by the Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish and wildlife, including those that are threatened with extinction.
native	A species that other than as a result of an introduction historically occurred or currently occurs in a particular ecosystem.
native plant	A plant that has grown in the region since the last glaciation, and occurred before European settlement.
natural disturbance event	Any natural event that significantly alters the structure, composition, or dynamics of a natural community (e.g., floods, fires, and storms).
non-consumptive, wildlife-oriented recreation	Wildlife observation and photography and environmental education and interpretation (see “wildlife-oriented recreation”).

non-native species	See “exotic species.”
non-point source pollution	A diffuse form of water quality degradation in which wastes are not released at one specific, identifiable point but from diffuse sources or a number of points or that are spread out and difficult to identify and control.
Notice of Intent (NOI)	An announcement we publish in the Federal Register that we will prepare and review an environmental impact statement or an environmental assessment [40 CFR 1508.22].
Notice of Availability (NOA)	An announcement we publish in the Federal Register that we have prepared an environmental impact statement or an environmental assessment and that it is available for public review and comment.
objective	See “unit objective.”
old fields	Areas formerly cultivated or grazed, where woody vegetation has begun to invade. [N.b. If left undisturbed, old fields will eventually succeed into forest. Many occur at sites marginally suitable for crops or pasture. They vary markedly in the Northeast, depending on soil and land use and management history.]
oligotrophic	Areas having a deficiency of plant nutrients that is usually accompanied by an abundance of dissolved oxygen.
ombrotrophic	Areas that receive their water from precipitation resulting in lower nutrient concentrations.
outdoor education	Educational activities that take place in an outdoor setting.
partnership	A contract or agreement among two or more individuals, groups of individuals, organizations, or agencies, in which each agrees to furnish a part of the capital or some service in kind (e.g., labor) for a mutually beneficial enterprise.
payment in lieu of taxes	cf. Revenue Sharing Act of 1935, Chapter One, Legal Context.
point source	A source of pollution that involves discharge of waste from an identifiable point, such as a smokestack or sewage-treatment plant outfall pipe.
population monitoring	Assessing the characteristics of populations to ascertain their status and establish trends on their abundance, condition, distribution, or other characteristics.
prescribed fire	The application of fire to wildland fuels, either by natural or intentional ignition, to achieve identified land use objectives [FWS Manual 621 FW 1.7].
priority public use	A compatible wildlife-dependent recreational use of a refuge involving hunting, fishing, wildlife observation or photography, or environmental education or interpretation.
private land	Land owned by a private individual or group or non-government organization.
private landowner	See “private land.”
private organization	Any non-government organization.
protection	Mechanisms like fee title acquisition, conservation easements, or binding agreements with landowners that ensure land use and land management practices will remain compatible with maintaining species populations at a site.

public	Individuals, organizations, and non-government groups; officials of Federal, State, and local government agencies; Native American tribes, and foreign nations—includes anyone outside the core planning team, those who may or may not have indicated an interest in the issues, and those who do or do not realize that our decisions may affect them.
public involvement	Offering an opportunity to interested individuals and organizations whom our actions or policies may affect to become informed; soliciting their individual opinions. We thoroughly study public input, and give it thoughtful consideration in shaping decisions about managing refuges.
public land	Land owned by the local, State, or Federal Government.
rare species	Species identified for special management emphasis because of their uncommon occurrence within a watershed.
rare community types	Plant community types classified as rare by any State program; includes exemplary community types.
refuge goals	According to "Writing Refuge Management Goals and Objectives: A Handbook," refuge goals are "…descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable units."
refuge purposes	According to the National Wildlife Refuge System Improvement Act of 1997, "The terms 'purposes of the refuge' and 'purposes of each refuge' mean the purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit."
refuge lands	Lands in which the Service holds full interest in fee title or partial interest like an easement.
restoration	Management of a disturbed or degraded habitat that results in the recovery of its original state (e.g., restoration may involve planting native grasses and forbs, removing shrubs, prescribed burning, or reestablishing habitat for native plants and animals on degraded grassland).
riparian	Referring to the interface between freshwater habitats and the terrestrial landscape.
riparian habitat	Habitat along the banks of a stream or river (see note above).
riverine	Within the active channel of a river or stream.
riverine wetlands	Generally, all the wetlands and deepwater habitats occurring within a freshwater river channel not dominated by trees, shrubs, or persistent emergents.
runoff	Water from rain, melted snow, or agricultural or landscape irrigation that flows over a land surface into a water body (see "urban runoff").
Service presence	Service programs and facilities that it directs or shares with other organizations; public awareness of the Service as a sole or cooperative provider of programs and facilities.

shrublands	Habitats dominated by various species of shrubs, often with many grasses and forbs.
species of concern or species of conservation concern	Species not Federally listed as threatened or endangered, but about which we or our partners are concerned.
species diversity	Usually synonymous with "species richness," but may also include the proportional distribution of species.
species richness	A simple measure of species diversity calculated as the total number of species in a habitat or community.
State agencies	Natural resource agencies of State governments.
State land	State-owned public land
State-listed species	See "Federally listed species."
step-down management plan	A plan for dealing with specific refuge management subjects, strategies, and schedules, e.g., cropland, wilderness, and fire [FWS Manual 602 FW 1.4.].
strategy	A specific action, tool, technique, or combination of actions, tools, and techniques for meeting unit objectives.
succession	The natural, sequential change of species composition of a community in a given area.
surface water	All waters whose surface is naturally exposed to the atmosphere, or wells or other collectors directly influenced by surface water.
sustainable development	The attempts to meet economic objectives in ways that do not degrade the underlying environmental support system. Note that there is considerable debate over the meaning of this term…we define it as "human activities conducted in a manner that respects the intrinsic value of the natural world, the role of the natural world in human well-being, and the need for humans to live on the income from nature's capital rather than the capital itself."
terrestrial	Living on land.
threatened species	A Federally listed, protected species that is likely to become an endangered species in the foreseeable future over all or a significant portion of its range.
tributary	A stream or river that flows into a larger stream, river, or lake, feeding it water.
trust resource	A resource that the Government holds in trust for the people through law or administrative act. [N.b. A federal trust resource is one for which responsibility is given wholly or in part to the Federal Government by law or administrative act. Generally, federal trust resources are nationally or internationally important no matter where they occur, like endangered species or migratory birds and fish that regularly move across state lines. They also include cultural resources protected by Federal historic preservation laws, and nationally important or threatened habitats, notably wetlands, navigable waters, and public lands like s national wildlife refuges.]

unfragmented habitat	Large, unbroken blocks of a particular type of habitat.
upland	Dry ground (i.e., other than wetlands).
upland meadow or pasture	Upland pastures are areas maintained in grass for livestock grazing; upland meadows are hay production areas. [N.b. Meadows may occur naturally in tidal marshes and inland flooded river valleys or, more frequently, at upland sites where vegetation has been cleared and grasses planted. Eventually, meadows will revert to old fields and forest if they are not mowed, grazed, or burned. Grasses in both managed meadows and pastures usually are similar, but pasture herbs often differ because of selective grazing.]
urban runoff	Water from rain, melted snow, or landscape irrigation flowing from city streets and domestic or commercial properties that may carry pollutants into a sewer system or water body.
vernal pool	Depressions holding water for a temporary period in the spring, and in which various amphibians lay eggs.
vision statement	A concise statement of what the refuge could achieve in the next 10 to 15 years.
watershed	The geographic area within which water drains into a particular river, stream, or body of water. A watershed includes both the land and the body of water into which the land drains.
wetlands	Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. These areas are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted to life in saturated soil conditions.
wilderness study areas	Lands and waters identified by inventory as meeting the definition of wilderness and being evaluated for a recommendation they be included in the Wilderness.
wilderness	See “designated wilderness area.”
wildfire	A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands [FWS Manual 621 FW 1.7].
wildlife-dependent recreation	Recreational activities in which wildlife is the focus of the experience. According to the National Wildlife Refuge Improvement Act of 1997, “The terms ‘wildlife-dependent recreation’ and ‘wildlife-dependent recreational use’ mean a use of a refuge involving hunting, fishing, wildlife observation or photography, or environmental education or interpretation.”
wildlife-dependent recreational use	A use of a national wildlife refuge involving hunting, fishing, wildlife observation or photography, or environmental education or interpretation (National Wildlife Refuge System Administration Act of 1966).
wildlife management	Manipulating wildlife populations, either directly by regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

Acronyms

Acronym	Full Name
ACJV	Atlantic Coast Joint Venture
ADA	American Disabilities Act
AHMP	Annual Habitat Management Plan
AQI	Air quality index
ARPA	Archaeological Resource Protection Act
ATV	All-terrain Vehicle
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BMP	Best Management Practice
CAP	Contaminants Assessment Protocol
CCP	Comprehensive Conservation Plan
CD	Compatibility Determination
CFR	Code of Federal Regulations
CWD	Chronic Wasting Disease
DEP	Department of Environmental Protection
DCNR	Department of Conservation and Natural Resources
EA	Environmental Assessment
EBJV	Eastern Brook Trout Joint Venture
EHD	Epizootic Hemorrhagic Disease
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FONSI	Finding of No Significant Impact
FTE	Full-time Employee
FY	Fiscal Year

GIS	Geographic Information System
HMP	Habitat Management Plan
IPCC	Intergovernmental Panel on Climate Change
LCC	Landscape Conservation Cooperative
LWCF	Land and Water Conservation Fund
MANEM	Mid-Atlantic/New England/Maritimes
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDEP	Maine Department of Environmental Protection
MBCF	Migratory Bird Conservation Fund
MGS	Maine Geological Survey
MNAP	Maine Natural Areas Program
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standard
NABCI	North American Bird Conservation Initiative
NAWCA	North American Wetlands Conservation Act
NAWMP	North American Waterfowl Management Plan
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NNL	National Natural Landmark
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRI	Nationwide Rivers Inventory
NVCS	Natural Vegetation Classification Standard
NWPS	National Wilderness Preservation System

NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NWSR	National Wild and Scenic River
NWSRS	National Wild and Scenic River System
OMB	Office of Management and Budget
ORV	Off-road Vehicle
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyls
PIF	Partners in Flight
PIN	Penobscot Indian Nation
REAP	Rehabilitation Environmental Action Plan
Refuge Improvement Act	National Wildlife Refuge System Improvement Act of 1997
Refuge System	National Wildlife Refuge System
RHPO	Regional Historic Preservation Officer
RNA	Research Natural Area
RONS	Refuge Operating Needs System
ROW	Right-of-way
SAMMS	Service Asset Maintenance Management System
SHC	Strategic Habitat Conservation
SHPO	State Historic Preservation Office
STEP	Student Temporary Employment Program
SUP	Special Use Permit
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
U.S.C.	United States Code (of laws)

USDA	United States Department of Agriculture
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	U.S. Geological Survey
VS	Visitor Services
WAP	Wildlife Action Plan
WCU	Wildlife Control Unit
WIA	Wilderness Inventory Area
WPA	Waterfowl Production Area
WSA	Wilderness Study Area
YCC	Youth Conservation Corps

Craig Lewis, USFWS

White-tailed deer

Bibliography

Bibliography

Allen, A.W. 1983. Habitat suitability index models: beaver. U.S. Fish and Wildlife Service, FWS/OBS-82/10.30.

Almendinger, J. and J. Leete. 1998. Peat characteristics and groundwater geochemistry of calcareous fens in the Minnesota River Basin, U.S.A. Biogeochemistry 43: 17-41.

Anderson. M. 1999. Viability and spatial assessment of ecological communities in the Northern Appalachian ecoregion. Ph.D dissertation, University of New Hampshire, Durham, New Hampshire.

Arrese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male Song Sparrows. Animal Behavior 35:773-784

Association of Fish and Wildlife Agencies (AFWA). 2009. Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans & Other Management Plans. Climate Change and Teaming With Wildlife Committees. 50 pp. Available online at *http://www.fishwildlife.org/files/AFWA-Voluntary-Guidance-Incorporating-Climate-Change_SWAP.pdf*.

Atlantic Coast Joint Venture (ACJV). 2005. Waterfowl Implementation Plan Revision. North American Waterfowl Management Plan. Available online at *http://www.acjv.org/wip/acjv_wip_main.pdf*.

Avery, M.L. 1995. Rusty blackbird. The Birds of North America, The Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania.

Ballard, W.B., D. Lutz, T.W. Keegan, L.H. Carpenter, and J.C. deVos, Jr. 2001. Deer-predator relationships: a review of recent North American studies with emphasis on mule and black-tailed deer. Wildlife Society Bulletin 29(1): 99-115.

Banks, P.B. and J.V. Bryant. 2007. Four legged friend or foe? Dog walking displaces native birds from natural areas. Biology Letters 3:611-613.

Baum, E.T. 1997. Maine Atlantic Salmon: A National Treasure, 1st ed. Hermon, ME: Atlantic Salmon Unlimited.

Beale, C.M. and P. Monaghan. 2004. Human disturbance: People as predation free predators? Journal of Applied Ecology. 41: 335-343.

Beason, Samuel L. 1974. Relationships between predator removal and white-tailed deer net productivity. The Journal of Wildlife Management. 38: 854-859.

Beedle, D. 1991. Physical dimensions and hydrologic effects of beaver ponds on Kuiu Island in southeast Alaska. Master's thesis. Oregon State University, Corvallis.

Bellrose, F.C. 1976. Ducks, geese and swans of North America. 2nd ed. Stackpole Books, Harrisburg, PA.

Bennett, K. and E. Zuelke. 1999. The Effects of Recreation on Birds: A Literature Review. Unpublished report. Submitted to: DE Division of Parks and Recreation, DNREC.

Berg, W.E. and Kuehn, D.W. 1986. Elusive Coyote. The Minnesota Volunteer 49: 9-13.

Bertin, R.I. 1977. Breeding habitats of the Wood Thrush and Veery. Condor 79:303-311.

Boggess, E.K., G.R. Batcheller, R.G. Linscombe, J.W. Greer, M. Novak, S.B. Linhart, D.W. Erickson, A.W. Todd, D.C. Juve, and D.A. Wade. 1990. Traps, trapping, and furbearer management. Wildlife Society Technical Review 90-1, The Wildlife Society, Bethesda, Maryland.

Bollinger, E.K. and T.A. Gavin. 1992. Eastern Bobolink populations: ecology and conservation in an agricultural landscape. Pages 497-506 in Ecology and conservation of neotropical migrant landbirds. (Hagan III, J. M. and D. W. Johnston, Eds.) Smithson. Inst. Press, Washington, DC.

Borns, H.W., Jr., L.A. Doner, C.C. Dorion, G.L. Jacobson, Jr., M.R. Kaplan, K.J. Kreutz, T.V. Lowell, W.B. Thompson, and T.K. Weddle. 2004, The deglaciation of Maine, U.S.A., in J. Ehlers and P.L. Gibbard (editors), Quaternary glaciations - extent and chronology, Part II: North America: Elsevier, Amsterdam, p. 89-109.

Brooks, R.T. 2003. Abundance, distribution, trends, and ownership patterns of early-successional forests in the northeastern United States. Forest Ecology and Management, 185:65-74.

Brown, S., C. Hickey, B. Harrington, and R. Gill. May 2001. United States Shorebird Conservation Plan. Manomet Center for Conservation Sciences. Manomet, Massachusetts. Available online at *http://www.fws.gov/shorebirdplan/USShorebird/downloads/USShorebirdPlan2Ed.pdf.* Accessed June 23, 2011.

Bryan, R.R. 2007. Focus species forestry: a guide to integrating timber and biodiversity management in Maine. Maine Audubon, Falmouth, Maine.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. Biol. Conserv. 21:231–241.

——— 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123–130.

Burger, J. and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. Journal of Comparative and Physiological Psychology 95:676-684.

——— 1990. Risk discrimination of direct versus tangential approach by basking black iguanas (Ctenosaura similis): variation as a function of human exposure. Journal of Comparative Psychology 104:388-394.

——— 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. Environmental Conservation 22:56-65.

Burkett, V. and J. Kusler. 2000. Climate change: potential impacts and interactions in wetlands of the United States. Journal of the American Water Resources Association 36: 313-320.

Bustard, D.R. and D.W. Narver. 1975. Aspects of the winter ecology of juvenile coho salmon (Oncorhynchus kisutch) and steelhead trout (Salmo gairdneri). Journal of the Fisheries Resource Board of Canada 32:667–680.

Butler, D.R. and G.P. Malanson. 1995. Sedimentation rates and patterns in beaver ponds in a mountain environment. Geomorphology 13(1–4):255–269.

Buyanovsky, G.A. and G.H. Wagner. 1998. Carbon cycling in cultivated land and its global significance. Global Change Biology 4:131-141.

Call, M.W. 1970. Beaver pond ecology and beaver trout relationships in southeastern Wyoming. Doctoral dissertation. University of Wyoming, Laramie.

Caron, M. 1986. Red fox assessment – 1985. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 34 pp.

Caron, M. 2013. Wildlife Biologist, Maine Department of Inland Fisheries and Wildlife, personal communication.

Carter, V. 1996. Technical Aspects of Wetlands, Wetland Hydrology, Water Quality, and Associated Functions. pp 35-48 in National Water Summary on Wetland Resources. J.D. Fretwell, J.S. Williams, and J.R. Redman, compilers. United States Geological Survey, Water-Supply Paper 2425. 431 pp. Available online at *http://www.google.com/books?id=UDU411JLwI8C*.

Carver, E. and J. Caudill, Ph.D. 2007 Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Washington, DC: U.S. Fish and Wildlife Service, Division of Economics.

Center for Disease Control and Prevention (CDC). 2010. Technical Fact Sheet: Eastern Equine Encephalitis.Available online at *http://www.cdc.gov/EasternEquineEncephalitis/tech/factSheet.html*.

Center for Disease Control and Prevention (CDC). 2012. West Nile virus (WNV) activity reported to ArboNET, by state, United States, 2012 (as of December 11, 2012). Available online at *http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control12MapsAnybyState.htm*.

CES, Inc. 1998. Closed Milford Landfill, 1997 Water quality monitoring results and 1997 year-end data review. Brewer, Maine.

Chronic Wasting Disease Alliance. 2012. Chronic wasting disease overview. Available online at *http://www.cwd-info.org/index.php/fuseaction/about.main*.

Clark, K.E., and L.J. Niles. 2000. Northern Atlantic Regional Shorebird Plan Version 1.0. Endangered and Nongame Species Program NJ Division of Fish and Wildlife. Woodbine, NJ. Available online at *http://www.fws.gov/shorebirdplan/RegionalShorebird/RegionalPlans.htm.* Accessed June 24, 2011.

Cline, R., N. Sexton, and S.C. Stewart. 2007. A human-dimensions review of human-wildlife disturbance: a literature review of impacts, frameworks, and management solutions: U.S. Geological Survey, Open-file Report 2007-1111. 89pp. Available online at *http://www.fort.usgs.gov/Products/Publications/21567/21567.pdf.* Accessed May 2012.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schultz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia. Available online at *http://www.natureserve.org/library/usEcologicalsystems.pdf*

Cook, D.S. 2007. Above the Gravel Bar: The Native Canoe Routes of Maine. Polar Bear & Company, Solon, Maine.

Cooper, W.E. 1997. Threat factors affecting antipredatory behavior in the broad-headed skink (Eumeces laticeps): repeated approach, change in predator path, and predators field of view. Copeia 1997:613-619.

——— 1998. Direction of predator turning, a neglected cue to predation risk. Behaviour 135:55-64.

Cooper, T.R. and K. Parker. 2010. American woodcock population status, 2010. U.S. Fish and Wildlife Service, Laurel, Maryland.

Cutko, A. 2009. Maine Natural Areas Program, personal communication with Moosehorn National Wildlife Refuge.

Darveau, M., J.L. DesGranges, and G. Gauthier. 1992. Habitat use by three breeding insectivorous birds in declining maple forests. Condor, 94:72-82.

Davis, R.B., G.L. Jacobson, L.S. Widoff, and A. Zlotsky. 1983. Evaluation of Maine peatlands for their unique and exemplary qualities. A report to the Maine Department of Conservation. Institute for Quaternary Studies and Department of Botany and Plant Pathology, University of Maine, Orono, Maine.

Davis, R.B. and Jacobson, G.L., Jr., 1985, Late-glacial and early Holocene landscapes in northern New England and adjacent areas of Canada: Quaternary Research, v. 23, p. 341-368.

Davis, R. and D. Anderson. 2001. Classification and distribution of Freshwater peatlands in Maine. Northeastern Naturalist 8:1-50. Davis, M.B., and R.G. Shaw. 2001. Range shifts and adaptive responses to quaternary climate change, Science 292: 673-679.

Deer Predation Work Group (DPWG). 2009. A Report to the Joint Standing Committee on Inland Fisheries and Wildlife. L.D. 2288—Resolve, To Create a Deer Predation Working Group: The working group's findings, recommendations, and recommended legislation.187 pp.

DeGraaf, R.M. and J.H. Rappole. 1995. Neotropical Migratory Birds. Comstock Pub. 676 pp.

DeGraaf, R.M. and M. Yamasaki. 2001. New England wildlife: habitat, natural history, and distribution. University Press of New England, Hanover, New Hampshire.

——— 2003. Options for managing early-successional forest and shrubland bird habitats in the Northeastern United States. Forest Ecology and Management, 185:179-191.

DePue, J. 2013. Furbearer and Small Mammal Biologist, Maine Department of Inland Fisheries and Wildlife, personal communication.

Dettmers, R. 2003. Status and conservation of shrubland birds in the Northeastern U.S. Forest Ecology and Management 185: 81-93.

——— February 2006. A blueprint for the design and delivery of bird conservation in the Atlantic northern forest. U.S. Fish and Wildlife Service, Hadley, Massachusetts. Available online at *http://www.acjv.org/documents/BCR_14_%20Blueprint.pdf*. Accessed June 10, 2011.

Diefenbach, D.R. and R.B. Owen, Jr. 1989. A model of habitat use by breeding black ducks. Journal of Wildlife Management. 53(2):383-389.

Dilger, W.C. 1956. Adaptive modifications and ecological isolating mechanisms in the thrush genera Catharus and Hylocichla. Wilson Bull. 68:171-199.

Dunaway, D., S.R. Swanson, J. Wendel, and W. Clary.1994. The effect of herbaceous plant communities and soil textures on particle erosion of alluvial streambanks. Geomorphology 9:47–56.

Dykstra, C.R., J.L. Hays, and S.T. Crocoll. 2008. Red-shouldered Hawk (*Buteo lineatus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/107*.

Environment Canada. 2004. Threats to Water Availability in Canada. National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 3 and ACSD Science Assessment Series No. 1. 128 p.

Escobedo, F., R. Northrop, and W. Zipperer. 2007. Developing an urban forest management plan for hurricane-prone communities. University of Florida- IFAS, EDIS FOR 121/FR176. 16 June 2008. Available online at *http://edis.ifas.ufl.edu/pdffiles/FR/FR17600.pdf*.

Evans, M., E. Gow, R.R. Roth, M.S. Johnson, and T.J. Underwood. 2011. Wood Thrush (Hylocichla mustelina), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/246*.

Ewald P.W. and F.L. Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31: 277-292.

Famous, M.S. and N. Famous. 1997. Sunkhaze Bog USFWS Wildlife Preserve: Permanent Vegetation Monitoring Plots Project, Maine, 50pp.

Federal Energy Regulatory Commission. 2012. Tree Trimming & Vegetation Management . Available online at *http://www.ferc.gov/industries/electric/indus-act/reliability/vegetation-mgt.asp.* Accessed September 2012.

Flatebo, G., C.R. Foss, and S.K. Pelletier. 1999. Biodiversity in the Forests of Maine: Guidelines for Land Management. UMCE Bull. 7147. Univ. Maine Cooperative Extension.

Foss, C.R. 1992. Wildlife in a changing landscape. Pages 14-22 in R. Ober, editor. At what cost? Shaping the land we call New Hampshire. New Hampshire Historical Society and the Society for the Protection of NH Forests, Concord, New Hampshire.

Foster, D.R. and G. Motzkin 2003. Interpreting and conserving the openland habitats of coastal New England: insights from landscape history. Forest Ecology and Management, 185:127-150.

Foster, D.R., G. Motzkin, D. Bernardos, and J. Cardoza. 2002. Wildlife dynamics in the changing New England landscape. Journal of Biogeography, 29:1337-1357.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and snowmobiles. Wildlife Society Bulletin 14:63-68.

Frid, A. and L. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology 6(1): 11. Available online at *http://www.consecol.org/vol6/iss1/art11*.

Friends of Unity Wetlands. 2006 Draft. Unity Wetlands Conservation Plan: Sustaining Our Wild and Working Landscape. Prepared with help from The Nature Conservancy and the Natural Resource Conservation Service. Available online at *ftp://ftp-fc.sc.egov.usda.gov/ME/tech/Water%20Resources/UnityWetlandsPlan.pdf.* Accessed July 5, 2011.

Gard, R. 1961. Effects of beaver on trout in Sagehen Creek, California. Journal of Wildlife Management 25:221–242.

Gawler, S. and A. Cutko. 2010. Natural landscapes of Maine: a guide to natural communities and ecosystems. Maine Department of Conservation, Augusta, Maine.

George, S. and K. Crooks. 2006. Recreation and large mammal activity in an urban nature reserve. Biological Conservation 133:107-117.

Gese, E. 2005. Demographic and Spatial Responses of Coyotes to Changes in Food and Exploitation. Proceedings of the 11th Wildlife Damage Management Conference. Paper 131. Pages 271 – 285. Available online at *http://digitalcommons.unl.edu/icwdm_wdmconfproc/131.* Accessed May 2012.

Gibbs, J.P., J.R. Longcore, D.G. McAuley, and J.K. Ringelman. 1991. Use of wetland habitats by selected nongame water birds in Maine. U.S. Fish and Wildlife Service, Washington, DC.

Gilbert, A.T. 1995. The Foraging and Habitat Ecology of Black Terns in Maine. Dept. of Wildlife Ecology, University of Maine, Orono. 148 pp. Available online at *http://digitalcommons.library.umaine.edu/*.

Gill, J.A., W.J. Sutherland, and A.R. Watkinson. 1996. A method to quanify the effects of human disturbance on animal populations. Journal of Applied Ecology 33:786-792.

Gompper, M.E. 2002. The ecology of Northeast coyotes: current knowledge and priorities for future research. Wildlife Conservation Society, Working Paper No. 17.

Gorham, E. 1991. Northern Peatlands: Role in the Carbon Cycle and Probable Response to Climatic Warming. Ecological Applications 1: 182-195.

Gregg, L. 1984. Population ecology of woodcock in Wisconsin. Wisconsin Dept. Nat. Resources. Tech. Bull. 144.

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of human intrusion on song occurrence and singing consistence in subalpine birds. The Auk 111: 28–37.

Hagan, J.M. and S.L. Grove. 1999. Coarse woody debris. Journal of Forestry 97 (1): 6-11.

Hagan, J.M. and A.A. Whitman. 2003. Late-Successional Forest in Northern Maine: a Disappearing Age Class and Implications for Biodiversity. Manomet Center for Conservation Sciences, Brunswick, ME.

Hammitt, W.E. and D.N. Cole. 1998. Wildlife Recreation: Ecology and Management (2nd edition). New York: John Wiley and Sons. 361p.

Hanson, W.D. and R.S. Campbell. 1963. The effects of pool size and beaver activity on distribution and abundance of warm-water fishes in a north Missouri stream. American Midland Naturalist 69:137–149.

Harlow, R.F., R.L. Downing, and D.H. VanLear. 2000. Responses of Wildlife to Clearcutting and Associated Treatments in the Eastern United States. Department of Forest Resources. Clemson University. Technical Paper No. 19. Available online at *http://www.clemson.edu/extfor/publications/fortp19/contents.htm.*

Hawes, E. and M. Smith. 2005. "Riparian buffer zones: Functions and recommended widths." Rep. to the Eightmile River Wild and Scenic Study Committee. Available online at *http://www.eightmileriver.org/resources/digital_library/appendicies/09c3_Riparian%20 Buffer%20Science_YALE.pdf.* Accessed Feb. 28, 2008.

Hayhoe, K., C.P. Wake, T.G. Huntington, L. Luo, M. Schwartz, J. Sheffield, E. Wood, B. Anderson, J. Bradbury, A. DeGaetano, T. Troy, and D. Wolfe. 2007. Past and future changes in climate and hydrological indicators in the U.S. northeast. Climate Dynamics 28:381-407.

Heath, L.S. and J.E. Smith. 2004. Criterion 5, Indicator 27: Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon. 7 p. In: Darr, David R., coord. Data report: A supplement to the national report on sustainable forests—2003. FS-766A. Washington, DC: U.S. Department of Agriculture. Available online at *http://www.fs.fed.us/research/sustain/contents.htm (8 June).*

Hering, D., M. Gerhard, E. Kiel, T. Ehlert, and T. Pottgiesser. 2001. Review: study on near-natural conditions of central European mountain streams, with particular reference to debris and beaver dams: results of the REG meeting 2000. Limmologica 31:81–92.

Herkert, J.R., D.E. Kroodsma, and J.P. Gibbs. 2001. Sedge Wren (*Cistothorus platensis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/582*.

Hodgman, T.P. and K.V. Rosenberg. 2000. Partners in flight land conservation plan: physiographic area 27: northern New England. Cornell Lab of Ornithology, Ithaca, New York.

Howden, L.M. and J.A. Meyer. May 2011. Age and Sex Composition: 2010 Census Briefs. U.S. Census Bureau. C2010BR-03. Available online at *http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf*.

Huey, W.S. and W.H. Wolfrum. 1956. Beaver-trout relations in New Mexico. Progressive Fish-Culturist 18:70–74.

Hunter Jr, M.L., A.J.K. Calhoun, and M. McCollough. 1999. Maine Amphibians and Reptiles. University of Maine Press. Orono.

Inkley, D.B., M.G. Anderson, A.R. Blaustein, V.R. Burkett, B. Felzer, B. Griffith, J. Price, and T.L. Root. 2004. Global climate change and wildlife in North America. Wildlife Society Technical Review 04-2. The Wildlife Society, Bethesda, Maryland.

Iverson, L.R., A.M. Prasad, and S. Matthews. 2008a. Modelling potential climate impacts on trees of the northeastern United States. Mitigation and Adaptation Strategies for Global Change 13:487–516.

Jakubus, W.J. 1999. Eastern Coyote Assessment. June 1999. Maine Department of Inland Fisheries and Wildlife. Bangor, ME. 67 pp. Available online at *http://www5.informe.org/ifw/wildlife/species/plans/mammals/easterncoyote/speciesassessment.pdf*. Accessed May 2012.

——— 2004. Furbearers and small game mammals. Pages 20-22 *in:* Wildlife Division Research and Management Report 2004. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 78 pp.

Johnson, C.W. 1985. Bogs of the northeast. University Press of New England, Hanover, New Hampshire.

Joint Sciences Academies' Statement. 2005. Available online at *http://www.nationalacademies.org/onpi/06072005.pdf*.

Jones, A.L. and P.D. Vickery. 1997. Conserving grassland birds: managing large grasslands including conservation lands, airports, and landfills over 75 acres for grassland birds. Center for Biological Conservation, Massachusetts Audubon Society, Lincoln, Massachusetts.

Keast, A. and M.G. Fox. 1990. Fish community structure, spatial distribution and feeding ecology in a beaver pond. Environmental Biology of Fishes 27:201–214.

Kelley, J.R., Jr. 2003. American woodcock population status, 2003. U.S. Fish and Wildlife Service, Laurel, Maryland.

Kendeigh, S.C. 1948. Bird populations and biotic communities in northern lower Michigan. Ecology 29:101-114.

Keppie, D.M. and R.M. Whiting, Jr. 1994. American Woodcock (Scolopax minor). In The Birds of North America, No. 100 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; The American Ornithologists' Union, Washington, DC.

Kiffney, P.M., J.S. Richardson, and J.P. Bull. 2003. Responses of periphyton and insects to experimental manipulation of riparian buffer width along forest streams. Journal of Applied Ecology 40:1060–1076.

Kiraly, I. 2012. Characterizing fish assemblage structure in the Penobscot River prior to dam removal. MS Thesis, University of Maine. 83 pages.

Kircheis, D. and T. Liebich. 2007. Habitat requirements and management considerations for Atlantic salmon (Salmo salar) in the Gulf of Maine distinct population segment (DPS). Gloucester (MA): NOAA-Fisheries, Northeast Region Protected Resources Division.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology : 1454–1465.

Knight, R.L. and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Knowlton, F.F. and E.M. Gese. 1995. Coyote population processes revisited. Symposium Proceedings—Coyotes in the Southwest: A Compendium of Our Knowledge, Paper 26. Available online at *http://digitalcommons.unl.edu/coyotesw/26*.

Knudsen, G.J. 1962. Relationship of beaver to forests, trout and wildlife in Wisconsin. Wisconsin Department of Natural Resources Technical Bulletin 25:1–50.

Komdeur, J. and R.K.H. Kats. 1999. Predation risk affects trade-offs between nest guarding and foraging in Seychelles warblers. Behavioral Ecology10:648-658.

Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M.A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird conservation for the Americas: The North American waterbird conservation plan, version 1. Waterbird Conservation for the Americas, Washington, DC.

Larouche, C., L.S. Kenefic, and J.C. Ruel. 2010. Northern white-cedar regeneration dynamics on the Penobscot Experimental Forest in Maine: 40-year results. Northern Journal of Applied Forestry. 27(1): 5-12.

Leidholt Bruner, K., D.E. Hibbs, and W.C. McComb. 1992. Beaver dam locations and their effects on distribution and abundance of coho salmon fry in two coastal Oregon streams. Northwest Science 66:218–223.

Lenth, B.E. and R.L. Knight. 2008. The effects of dogs on wildlife communities. Natural Areas Journal 28: 218-227.

Liddle, M. 1997. Recreation Ecology: The Ecological Impact of Outdoor Recreation and Ecotourism, London: Chapman & Hall.

Litvaitis, J.A. 2003. Are pre-Columbian conditions relevant baselines for managed forests in the Northeastern United States? Forest Ecology and Management, 185:113-126.

Longcore, J.R., D.G. Mcauley, G.R. Hepp, and J.M. Rhymer. 2000. American Black Duck (*Anas rubripes*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/481*.

Lorimer, C.G. 1977. The presettlement forest and natural disturbance cycle of northeastern Maine. Ecology, 58:139-148.

Lorimer, C.G. and A.S. White. 2003. Scale and frequency of natural disturbances in the Northeastern U.S.: implications for early successional forest habitats and regional age distributions. Forest Ecology and Management, 185:41-64.

Lowther, P., A.F. Poole, J.P. Gibbs, S. Melvin, and F.A. Reid. 2009. American Bittern (*Botaurus lentiginosus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/018. doi:10.2173/bna.18*.

Maine Department of Conservation Bureau of Parks and Lands (MBPL). December 2009. Maine State Comprehensive Outdoor Recreation Plan, 2009-2014. Accessed January 2013. Available online at *http://www.maine.gov/doc/parks/programs/SCORP/index.html*.

Maine Department of Environmental Protection (MEDEP). 2004. Phosphorus control action plan and total maximum daily (annual phosphorus) load report: Unity Pond (Lake Winnecook), Waldo County, Maine. Available online at *http://www.maine.gov/dep/blwq/docmonitoring/impairedwaters/2004unitypondreport.pdf*

——— 2011a. Overview of Statutory Authority and the Bureau of Air Quality. Bureau of Air Quality. Available online at *http://www.maine.gov/dep/air/overview.htm*.

——— 2011b. Wood Stove Emissions – Background. Available online at *http://maine.gov/dep/air/education/woodstv.htm.* Accessed September 29, 2011.

——— 2011c. Classification of major river basins. Available online at *http://www.mainelegislature.org/legis/statutes/38/title38sec467.html*.

——— 2013. Air Toxics Overview. Accessed January 2013. Available online at h*ttp://www.maine.gov/dep/air/toxics/overview.html*.

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2001. Black Bass Management Plan. Department of Inland Fisheries and Wildlife Division of Fisheries and Hatcheries. 39 pp. Available online at *http://www.maine.gov/ifw/fishing/species/management_plans/blackbass.pdf.* Accessed January 29, 2013.

——— 2002. Minor Sportfish Management Plan. Department of Inland Fisheries and Wildlife Division of Fisheries and Hatcheries. 31pp. *http://www.maine.gov/ifw/fishing/species/management_plans/minorsportfish.pdf.* Accessed January 29, 2013.

——— September 2005. Maine's comprehensive wildlife conservation strategy. Augusta, Maine. Available online at *http://maine.gov/ifw/wildlife/groups_programs/comprehensive_strategy/index.htm.* Accessed June 28, 2011.

——— 2008a. Beginning with habitat, Maine conservation priorities. Available online at *http://www.maine.gov/ifw/wildlife/groups_programs/comprehensive_strategy/pdfs/statewide_focus_area_map.pdf.*

——— 2008b. Chain Pickerel Assessment. Department of Inland Fisheries and Wildlife Division of Fisheries and Hatcheries. 17pp. *http://www.maine.gov/ifw/fishing/species/management_plans/pickerel.pdf.* Accessed January 29, 2013.

——— 2011. Maine's Game Plan for Deer: A Plan to Increase Maine's Northern, Western, and Eastern Deer Herd. 40 pp.

——— 2013a. Deer Harvest Information for Maine. Accessed January 2013. Available online at *http://www.maine.gov/ifw/hunting_trapping/hunting/harvest.htm*.

——— 2013b. White-tails in Maine Woods. Accessed January 2013. Available online at *http://www.maine.gov/ifw/wildlife/species/deer/index.htm*.

——— 2013c. Black Tern (*Chlidonias niger)*. Accessed January 2013. Available online at *http://www.maine.gov/ifw/wildlife/species/endangered_species/black_tern/index.htm*.

Maine Department of Labor (MDL). 2011. Statewide Labor Statistics. Available online at *http://www.maine.gov/labor/labor_stats/index.html*.

Maine Forest Service. 2012. FAQs About Maine's Forests – Overview. Quoted via Forest for Maine's Future, a partnership between Maine Tree Foundation, Small Woodland Owners Association of Maine, Maine Forest Service, and the Center for Research on Sustainable Forests at the University of Maine. Available online at *http://www.forestsformainesfuture.org/forest-facts/#section9/*.

Maine Geological Survey (MGS). 2005. Surficial Geologic History of Maine. Maine Department of Conservation. Available online at *http://maine.gov/doc/nrimc/mgs/explore/surficial/facts/surficial.htm.* Accessed October 4, 2011.

——— 2011. The Sunkhaze Peatland Complex. Maine Department of Conservation. Available online at *http://www.maine.gov/doc/nrimc/mgs/explore/lakes/sites/dec99.htm.* Accessed October 4, 2011.

Maine Natural Areas Program (MNAP). 1998. Northern white cedar seepage forest. Maine Natural Areas Program, Augusta, Maine.

——— 1999. Hardwood floodplain forest. Maine Natural Areas Program, Augusta, Maine.

——— 2004. Showy lady's-slipper. Maine Natural Areas Program, Augusta, Maine.

——— 2010. Sunkhaze Meadows site summary survey form. Maine Department of Conservation, Maine Natural Areas Program, Augusta, Maine.

——— 2011. Focus Areas of Statewide Ecological Significance: Sunkhaze Meadows. Maine Natural Areas Program, Augusta, Maine. Available online at *http://www.maine.gov/doc/nrimc/mnap/focusarea/sunkhaze_meadows_focus_area.pdf*.

——— 2011b. Focus Areas of Statewide Ecological Significance: Carlton Pond North. Maine Natural Areas Program, Augusta, Maine. Available online at *http://www.maine.gov/doc/nrimc/mnap/focusarea/carlton_pond_north_focus_area.pdf*.

——— 2012. Ecosystems in Maine: Unpatterned Fen Ecosystem. Maine Natural Areas Program, Augusta, Maine. Available online at *http://www.maine.gov/doc/nrimc/mnap/features/eco_unpattfen.htm*.

Maine Rivers. 2011. Sebasticook River. Available online at *http://mainerivers.org/watershed-profiles/sebasticook-river/*.

Maine State Planning Office (MSPO). 2011. Maine Economics and Demographics Program. Available online at *http://www.maine.gov/spo/economics/*. Accessed September 22, 2011.

MANEM Waterbird Working Group. 2006. Waterbird Conservation Plan for the Mid-Atlantic/ New England/Maritimes Region: 2006-2010. Available online at *http://www.waterbirdconservation.org/manem.html*.

Marchand, P.J. 1987. North woods: an inside look at the nature of forests in the Northeast. Appalachian Mountain Club, Boston, Massachusetts.

McCollough, M., C. Todd, B. Swartz, P. deMaynadier, and H. Givens. 2003. Maine's endangered and threatened wildlife. Maine Department of Inland Fisheries and Wildlife, Augusta, Maine.

McLaughlin, C.R. 1995. Bobcat management system. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 21 pp. plus appendices.

McMahon, J.S. 1990. The biophysical regions of Maine: patterns in the landscape and vegetation. Thesis, University of Maine, Orono, USA.

Michigan Department of Natural Resources (MDNR). 2012. Ash Management: Emerald Ash Borer. Forest Resources Division. Report IC 4029. 23 pp. Available online at *http://www.emeraldashborer.info/files/Ash_Mgt_Guidelines.pdf.*

Maine Department of Transportation (MaineDOT). 2011. Bangor I-95 Corridor Study. Maine Department of Transportation (MaineDOT). Bureau of Transportation Systems Planning. 144 pp. Available online at *http://www.maine.gov/mdot/planningstudies/bangori95study/docs/pdf/bangorI-95CorridorStudyFinal2011a.pdf.*

Michigan State University (MSU). 2012. Emerald Ash Borer Overview. Emerald ash borer collaboration information cooperative between USDA Forest Service, Michigan State University, Purdue University and Ohio State University. Available online at *http://www.emeraldashborer.info/index.cfm*.

Mierzykowski, S.E. and K.C. Carr. 2004. Contaminant Survey of Sunkhaze Stream and Baker Brook: Sunkhaze Meadows National Wildlife Refuge, Milford, Maine. U.S. Fish and Wildlife Service. Old Town, Maine. Publication Number FY04-MEFO-2-EC. 45 pp.

Millar, C.I., N.L. Stephenson, and S.L. Stephens. 2007. Climate change and forests of the future: Managing in the face of uncertainty. Ecological Applications 17(8): 2145-2151.

Miller, S.G., R.L. Knight, and C.K. Miller. 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1): 124-132.

Mitchell, L.R., C.R. Smith, and R.A. Malecki. 2000. Ecology of grassland breeding birds in the Northeastern United States: A literature review with recommendations for management.

USGS, Biological Resources Division, New York Cooperative Fish and Wildlife Research Unit, Cornell University, Ithaca, N.Y.

Moore, M., M. Pace, J. Mather, P. Murdoch, R. Howarth, C. Folt, C. Chen, H. Hemond, P. Flebbe, and C. Driscoll. 1997. Potential effects of climate change on freshwater ecosystems of the New England/Mid-Atlantic Region. Hydrological Processes : 925-947.

Morrill, R. and A. Kimball. October 2009. Penobscot Experimental Forest Management Plan. University of Maine.

Morris, K.I. 1986. Bobcat Assessment 1986. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 43 pp.

Morse, D.H. 1971. Effects of the arrival of a new species upon habitat utilization by two forest thrushes in Maine. Wilson Bull. 83:57-65.

Murphy, M.L., J. Heifetz, J.F. Thedinga, S.W. Johnson, and K.V. Koski. 1989. Habitat utilization by juvenile Pacific salmon (Oncorhynchus) in the glacial Taku River, southeast Alaska. Canadian Journal of Fisheries and Aquatic Sciences 46:1677–1685.

Myer, J., M. Sale, M. MulHolland, and L. Poff. 1999. Impacts of climate change on aquatic ecosystem functioning and health. Journal of the American Water Resources Association 35: 1373-1386.

The National Academies. 2005. Joint science academies' statement: Global response to climate change. Washington, DC. Available online at *http://www.nationalacademies.org/onpi/06072005.pdf.*

National Marine Fisheries Service (NMFS). 2009. Designation of Critical Habitat for Atlantic Salmon (Salmo salar) in the Gulf of Maine Distinct Population Segment. Final ESA Section 4(b)(2) Report. National Marine Fisheries Service Northeast Region. 36 pp. Available online at *http://www.nero.noaa.gov/prot_res/altsalmon/4(b)(2)%20Report%20Final.pdf.*

National Wildlife Refuge Association (NWRA). 2002. Silent Invasion – A Call to Action. Washington, DC. 18pp. Available online at *http://www.refugenet.org/new-pdf-files/Silent%20Invasion%20pdf.pdf.*

New Hampshire Fish and Game (NHFG). 2005. New Hampshire Wildlife Action Plan. New Hampshire Fish and Game Department, Concord, New Hampshire.

Niemi, G.J. and J.M. Hanowski. 1984. Relationships of breeding birds to habitat characteristics in logged areas. Journal of Wildlife Management 48: 438-443

Northeast Furbearer Resources Technical Committee. 1996. Trapping and furbearer management: perspectives from the Northeast. 33pp.

Ochterski, J. 2006. Hayfield Management and Grassland Bird Conservation. Cornell Cooperative Extension of Schuyler County, N.Y. 8 pp. Available online at *http://www.fingerlakesrcd.org/Documents/Hayfield%20Grassland%20Bird%20Conservation.pdf*.

Peck, G.K. and R.D. James. 1983. Breeding birds of Ontario Nidiology and Distribution, vol 1: nonpasserines. Royal Ont. Museum, Toronto.

Penobscot River Restoration Trust. n.d. Available online at *http//www.penobscotriver.org*. Accessed December 14, 2011.

Pinkney, A.E., S.K. Krest, and K.L. Munney. 2005. Investigations into Abnormalities of Frogs on Region 5 National Wildlife Refuges: 2005 Year-end Report. U.S. Fish and Wildlife Service. Publication Numbers RY2006-NEFO-EC-2 & CBFO-C06-05. 116 pp.

Pollock, M., M. Heim, and D. Werner. 2003. Hydrologic and Geomorphic Effects of Beaver Dams and Their Influence on Fishes. American Fisheries Society Symposium 37. 22 pp.

Poole, A.F., R.O. Bierregaard, and M.S. Martell. 2002. Osprey (Pandion haliaetus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/683doi:10.2173/bna.683*.

Prasad, A.M., L.R. Iverson, S.N. Matthews, and M.P. Peters. 2007. Climate Change Atlas: www.nrs.fs.fed.uslatlas

Ratcliff, D.A. 1980. The peregrine falcon. Buteo Books, Vermillion, S.D. 416 pp.

Regosin J.V., B.S. Windmiller, R.N. Homan, and J.M. Reed. 2005. Variation in terrestrial habitat use by four pool-breeding amphibian species. J. Wild. Manage. 69:1481–93.

Reid, K.A. 1952. Effect of beaver on trout waters. Md. Conservancy 29 (4): 21-23.

Reitsma, L., M. Goodnow, M.T. Hallworth, and C.J. Conway. 2010. Canada Warbler (*Cardellina canadensis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/421*.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butler, D.W. Demarest, E.H., Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, and T.C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology, Ithaca, New York.

Richardson, J.C. and C.K. Miller. 1997. Recommendations for protecting raptors from human disturbance: a review. Wildlife Society Bulletin. 25(3):634-63.

Richardson, B. 2008. Regional Landscape Conservation in Maine Status Report and Interim Summary. Draft under development by Maine State Planning Office. 6 pp.

Rittenhouse, T.A.G. and R.D Semlitsch. 2007. Postbreeding habitat use of wood frogs in a Missouri oak-hickory forest. J. Herp. 41:645–53.

Robb, J.R. 1986. The importance of nesting cavities and brood habitat to Wood Duck production. Masters Thesis. Ohio State Univ. Columbus.

Robinson, B. 2011. Cultural Resource Opportunities of the Sunkhaze Meadows. Preliminary Comments for the Sunkhaze Meadows NWR and Carlton Pond WPA Comprehensive Conservation Plan. Anthropology Deparhnent. University of Maine. Orono, Maine. 8 pp.

——— 2012. Cultural Resources of the Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. Department of Anthropology and Climate Change Institute, University of Maine. Orono, Maine. 114 pp.

Rodgers, J.A. and H.T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139–145.

Rosenburg, K.V. and T.P. Hodgman. June 2000. Partners In Flight Landbird Conservation Plan: Physiographic Area 28: Eastern Spruce-Hardwood Forest. Northeast Partners In Flight Working Group and American Bird Conservancy, The Plains, VA 46pp. Available online at *http://www.partnersinflight.org/bcps/plan/pl_28_10.pdf*. Accessed June 23, 2011.

Roth, R.R., M.S. Johnson, and T.J. Underwood. 1996. Wood Thrush. In The Birds of North America, No. 246 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists Union, Washington, DC.

Rothbart, P. and S. Capel. 2006. Maintaining and Restoring Grasslands. In Managing grasslands, shrublands, and young forest habitats for wildlife: A guide for the northeast (J.D. Ohler, D.F. Covell, S. Capel, and B. Long, eds.). The Northeast Upland Habitat Technical Committee. Massachusetts Division of Fisheries and Wildlife.

Rudolph, D.C. and J.G. Dickson. 1990. Streamside zone width and amphibian and reptile abundance. The Southwestern Naturalist. 35(4). 472-476.

Rupp, R.S. 1954. Beaver-trout relationship in the headwaters of Sunkhaze Stream, Maine. Transactions of American Fisheries Society, 84:75-85.

——— 1955. Studies of the eastern brook trout population and fishery in Sunkhaze Stream, Maine. Journal of Wildlife Management, 19(3): 336-345.

Salyer, J.C. 1935. A program of beaver management recommended for the management of both beaver and trout in Michigan. American Game 24: 39-64.

Scheffer, P.M. 1938. The beaver as an upstream engineer. Soil conservation 3:178–181.

Schlossberg, S.R. and D.I. King. 2007. Ecology and management of scrub-shrub birds in New England: A comprehensive review. Report submitted to Natural Resources Conservation Service, Resource Inventory and Assessment Division, Beltsville, Maryland, USA.

Schlosser, I.J. 1995. Dispersal, boundary processes, and trophic-level interactions in streams adjacent to beaver ponds. Ecology 76:908–925.

Schultz, R.D. and M. Stock. 1993. Kentish plovers and tourist-competitors on sandy coasts? Wader Study Group Bulletin 68(special issue): 83-92.

Seavy, N.E., T. Gardali, G.H. Golet, F.T. Griggs, C.A. Howell, R. Kelsey, S.L. Small, J.H. Viers, and J.F. Weigand. 2009. Why Climate Change Makes Riparian Restoration More Important than Ever: Recommendations for Practice and Research. Journal of Ecological Restoration Vol. 27, No. 3, ISSN 1522-4740 E-ISSN 1543-4079. 330-338 pp.

Sebasticook River Watershed Association. n.d. Available online at *http://www.sebasticookriver.org*.

Sepik, G., R.B. Owen, and M.W. Coulter. 1981. A landowner's guide to woodcock management in the northeast. Maine Acgricultural Experiment Station, University of Maine, Orono, Maine.

Sepik, G.F. and E.L. Derleth. 1993. Premigratory dispersal and fall migration of American Woodcocks in Maine. Pages 36-40 in Proc. Eighth Woodcock Symp. (Longcore, J.R. and G.F. Sepik, Eds.) Biol. Rep. 16, U.S. Fish Wildl. Serv. Washington, DC.

Seymore, R.S., A.S. White, and P.G.deMaynadier. 2002. Natural disturbance regimes in northeastern North America – evaluating silvicultural systems using natural scales and frequencies. Forest Ecology and Management. 155: 357-367

Shaffer, G. 2011. Archaeological Overview for the Unity Wetlands Conservation Plan. Appendix G of the Unity Wetlands Conservation Plan. Natural Resource Conservation Service. Available online at *http://www.me.nrcs.usda.gov/technical/AreawidePlans.html*.

Sibley, D. 1993. The birds of Cape May. New Jersey Audubon, Cape May, NJ.

Siegel, D. and P. Glaser. 2006. Potential effects of climate change on spring fens and their endangered floral species. Geological Society of America Abstracts 38: 328.

Sirkin, L. 1986, Pleistocene stratigraphy of Long Island, New York, in Cadwell, D.H. (editor), The Wisconsinan stage of the first geological district, eastern New York: New York State Museum, Bulletin 455, p. 6-21.

Smith, B.W., C. Dobony, and J. Edwards. 2004. Survival and Cause Specific Mortality of Ruffed Grouse. In the Final Project Report of the Appalachian Cooperative Grouse Research Project: Ruffed Grouse Ecology and Management in the Appalachian Region. pp 27-29.

Smithwood, D.A. and J.F. McKeon. 1999. Sunkhaze Meadows National Wildlife Refuge fisheries management plan. U.S. Fish and Wildlife Service, Laconia, New Hampshire.

Snodgrass, J.W. and G.K. Meffe. 1998. Influence of beavers on stream fish assemblages: effects of pond age and watershed position. Ecology 79:928–942.

——— 1999. Habitat use and temporal dynamics of blackwater stream fishes in and adjacent to beaver ponds. Copeia 3:628–639.

Soulliere, G.J. 1990. Review of Wood Duck nest-cavity characteristics. Pages 153-162 in Proc. 1988 N. Am. Wood Duck symp. (Frederickson, L.H., G.V. Burger, S.P. Havera, D.A. Graber, R.E. Kirby, and T.S. Taylor, Eds.)

Spiess, A. Personal communication to Beth Goettel, Refuge Manager, Maine Coastal Islands Refuge Complex. April 7, 2011.

Squires, J.R. and R.T. Reynolds. 1997. Northern Goshawk (Accipiter gentilis), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at *http://bna.birds.cornell.edu/bna/species/298*.

Stein, S., R.E. McRoberts, R.J. Alig, M.D. Nelson, M.D. Theobald, M. Eley, M. Decheter, and M. Carr. 2005. Forests on the edge: a GIS-dased approach to projecting housing development on American's private forests. USDA, Forest Service, Pacific Northweast Research Station, General Technical Report, PNW-GTR-636.

Stockwell, S.S. and M.L. Hunter, Jr. 1983. A description of the wildlife in 27 Maine peatlands. Maine Department of Inland Fisheries and Wildlife and Maine Land Use Regulation Commission. Wildlife Division, University of Maine, Orono.

Swales, S., F. Caron, J.R. Irvine, and C.D. Levings. 1988. Overwintering habitats of coho salmon (Oncorhynchus kisutch) and other juvenile salmonids in the Keogh River system, British Columbia. Canadian Journal of Zoology 66:254–261.

Swearingen, J., B. Slattery, K. Reshetiloff, and S. Zwicker. 2010. Plant Invaders of Mid-Atlantic Natural Areas, 4th ed. National Park Service and U.S. Fish and Wildlife Service. Washington, DC. 168pp. Available online at *http://www.nps.gov/plants/alien/pubs/midatlantic/midatlantic.pdf*.

Tang, G. and B. Beckage. 2010. Projecting the distribution of forests in New England in response to climate change. Diversity and Distributions 16:144-158.

Tefft, B.C. 2006. Managing shrublands and old fields in Managing grasslands, shrublands and young forests: a guide to the northeast. Northeast Upland Habitat Technical Committee.

The Nature Conservancy (TNC). 2011. Lower Penobscot Forest. Available online at *http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/maine/explore/lowerpenforest.pdf*.

Thieling, T.M. 2006. Assessment and predictive model for brook trout (*Salvelinus fontinalis*) population status in the Eastern United States. A Master of Science thesis. James Madison University, Harrisonburg, Virginia.

Thompson, W.B. and H.W. Borns, Jr. 1985. Surficial geologic map of Maine: Maine Geological Survey, scale 1:500,000.

Toniolo, K., S. Bowden, and T. Watson. 2011. Visitor Services Review for Sunkhaze Meadows National Wildlife Refuge. U.S. Fish and Wildlife Service. 10 pp.

Trani, M.K., R.T. Brooks, T.L. Schmidt, V.A. Rudis, and C.M. Gabbard. 2001. Panerns and trends of early-successional forests in the Eastern United States. Wildl. Soc. Bull. 29, 413124.

Turner, M.M., A.P. Rockhill, C.S. Deperno, J.A. Jenks, R.W. Klaver, A.R. Jarding, T.W. Grovenburg, and K.H. Pollock. 2011. Evaluating the effect of predators on white-tailed deer: Movement and diet of coyotes. The Journal of Wildlife Management, 75: 905-912

U.S. Census Bureau. 2010. 2010 Census Data. Available online at *http://2010.census.gov/2010census/data/.* Accessed September 22, 2011.

——— 2011. State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, Small Area Income and Poverty Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Repor. Last Revised: December 23, 2011. Available online at *http://quickfacts.census.gov/qfd/states/23000.html*.

——— 2012. Labor Force, Employment, and Earnings. Data derived from U.S. Bureau of Labor Statistics, "Employment and Wages Online Annual Averages, 2009," <*http://www.bls.gov/cew/cewbultn09.htm*>. Available online at *http://www.census.gov/compendia/statab/2012/tables/12s0646.pdf*.

U.S. Department of Agriculture (USDA). 2012. Plant Health: Asian Longhorn Beetle. Animal and Plant Health Inspection Service. Available online at *http://www.aphis.usda.gov/plant_health/plant_pest_info/asian_lhb/background.shtml*.

——— 2011. Web Soil Survey for Penobscot and Kennebec Counties, Maine. Available online at *http://websoilsurvey.nrcs.usda.gov/app/.* Accessed March 2011.

U.S. Environmental Protection Agency (USEPA). 2011. Region 1: EPA New England – Air Quality Issues. Available online at *http://www.epa.gov/region1/aqi/*. Accessed September 29, 2011.

U.S. Fish and Wildlife Service (USFWS). 1990. A review of secondary uses occurring on National Wildlife Refuges: 232 p.

——— 1996. American woodcock management plan: Eastern region. U.S. Fish and Wildlife Service, Hadley, Massachusetts.

——— 1999. Sunkhaze Meadows National Wildlife Refuge: Fisheries Management Plan. June 1999. Office of Fishery Assistance. Lacone, New Hampshire. 43 pp.

——— 2001a. Fire Management Plan, Sunkhaze Meadows National Wildlife Refuge. December 2001. 62 pp plus appendices.

——— 2001b. Final Environmental Assessment: Furbearer Management, Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. Old Town, Maine. October 2001. Prepared by U.S. Department of the Interior, Fish and Wildlife Service, Sunkhaze Meadows National Wildlife Refuge. 35 pp.

——— 2002. Fire Management Plan Sunkhaze Meadows National Wildlife Refuge and its Divisions: Benton Division, Carlton Pond WPA, Sandy Stream Division. 61 pp plus appendices.

——— 2003. The National Strategy for Management of Invasive Species: National Wildlife Refuge System. Fulfilling the Promise: National Invasive Species Management Strategy Team. U.S. Fish and Wildlife Service, Washington, D.C. Available online at *http://www.fws.gov/invasives/pdfs/NationalStrategyFinalRevised05-04.pdf*.

——— 2004. North American waterfowl management plan. U.S. Fish and Wildlife Service, Washington, DC.

——— 2005. National Wildlife Refuge System Visitation Estimation Workbook. Arlington, VA. 80 pp.

——— 2007. Waterfowl Production Areas: Prairie Jewels of the National Wildlife Refuge System. U.S. Fish and Wildlife Service, Washington, DC. Available online at *http://www.fws.gov/refuges/smallwetlands/WPAs/FactSheetWPA-june2007.pdf*.

——— 2008a. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Available online at *http://www.fws.gov/migratorybirds/*. Accessed June 28, 2011.

——— 2008b. Comprehensive Species List for Sunkhaze Meadows NWR and Carlton Pond WPA. January 2008 Version. Sunkhaze Meadows NWR and Carlton Pond WPA.

——— 2009. Northeast Region Fisheries Program Strategic Plan: Fiscal Years 2009-2013. United States Department of Interior, Fish and Wildlife Service, Northeast Fisheries Program, Hadley, Massachusetts. 23 pp. Available online at *http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf*. Accessed June 28, 2011.

——— 2010. Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change. 36 pp. Available online at *http://www.fws.gov/home/climatechange/pdf/CCStrategicPlan.pdf*.

——— October 2011a. Conserving the Future: Wildlife Refuges and the Next Generation. U.S. Department of the Interior. Available online at *http://americaswildlife.org/wp-content/uploads/2011/10/Final-Vision-Document.pdf*.

——— 2011b. Special Management Areas. U.S. Department of the Interior. Available online at *http://www.fws.gov/refuges/whm/wilderness.html*.

U.S. Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 2008. The 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Maine.

U.S. Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. December 2012. The 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available online at *http://www.census.gov/prod/2012pubs/fhw11-nat.pdf*.

Van Daele, L.J. and H.A. Van Daele. 1982. Factors affecting the productivity of ospreys nesting in west-central Idaho. Condor 84:292-299.

White, C.M. and T.L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. Condor 87:14-22.

Whitham, J.W. and M.L. Hunter, Jr. 1992. Population trends of neotopical migrant landbirds in northern coastal New England. Pp. 85-95 in Ecology and conservation of neotropical migrant landbirds (J. M. Hagen III and D. W. Johnston, eds). Smithson. Inst. Press, Washington, DC.

Whitman, A.A. and J.M. Hagan. 2007. An index to identify late-successional forest in temperate and boreal zones. Forest Ecology and Management 246:144-154.

Whitman, A.B., P. Vickery, P. deMaynadier, S. Stockwell, S. Walker, A. Cutko, and R. Houston. 2010. Climate change and biodiversity in Maine: a climate change exposure summary for participants of the Maine climate change species vulnerability assessment. Manomet Center for Conservation Sciences (in collaboration with Maine Beginning with Habitat

Climate Change Adaptation Working Group) Report NCI-2010-2. Brunswick, Maine. Available online at: *http://www.manometmaine.org*.

Wiens, J.A. 1969. An approach to the study of ecological relationships among grassland birds. Orn. Monogr. No. 8:1-93.

Williams, B.K., R.C. Szaro, and C.D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior technical guide. Washington, DC: U.S. Department of the Interior.

Winter, T. 2000. The vulnerability of wetlands to climate change: A hydrologic landscape perspective. Journal of the American Water Resources Association 36:305–311.

Appendix A

Edward Peter Steenstra, USFWS

Male adult Atlantic salmon.

Species of Conservation Concern on Sunkhaze Meadows NWR and Carlton Pond WPA

Appendix A

Species of Conservation Concern on Sunkhaze Meadows NWR and Carlton Pond WPA

Species*	Seasons on Refuge[1]	Federal T&E[2]	Maine T&E[3]	BCR 14[4]	PIF 27 and 28[5]	ME Comprehensive Wildlife Conservation Plan[6]	USFWS Birds of Conservation Concern[7]	Fish Species of Conservation & Mgmt. Concern[8]	Shorebird Plan-Atlantic Flyway[9]	Waterbird Plan[10]	Waterfowl Plan[11]
WATERBIRDS											
American bittern	B			M		2	X				
Black-crowned night-heron	M		T	H		2				M	
Black tern	B		E			1				M	
Common loon	B			M		2					
Common moorhen	M		T								
Great blue heron	M		SC								
Herring gull	YR			H							
Least bittern	B		E			2	X				
Pied-billed grebe	M					2	X				
Yellow rail	M		SC	M		2	X				
WATERFOWL											
American black duck	B			HH	II	2					D
Atlantic Canada goose	B			H							I
Blue-winged teal	B										I
Bufflehead	M										I
Common goldeneye	M			M							NT
Gadwall	M										I
Green-winged teal	B										I
Hooded merganser	B										I
Mallard	B										NT
Northern pintail	M										D
Red-breasted merganser	M										I
Wood duck	B			M							I
SHOREBIRDS											
American woodcock	B			HH	I	2			5		
Black-bellied plover	M			H					3		
Common snipe	B								3		
Greater yellowlegs	M					2			4		
Killdeer	B			M					2		
Least sandpiper	M			M					3		
Lesser yellowlegs	M						X		2		
Semipalmated sandpiper	M		SC	HH		2	X		4		
Solitary sandpiper	M						X		3		
Spotted sandpiper	B								3		
Upland sandpiper	M		T	H	II	1	X		4		

Species*	Seasons on Refuge[1]	Federal T&E[2]	Maine T&E[3]	BCR 14[4]	PIF 27 and 28[5]	ME Comprehensive Wildlife Conservation Plan [6]	USFWS Birds of Conservation Concern[7]	Fish Species of Conservation & Mgmt. Concern[8]	Shorebird Plan-Atlantic Flyway[9]	Waterbird Plan[10]	Waterfowl Plan[11]
LANDBIRDS											
American redstart	B		SC	H							
Bald eagle	B,M		SC	M		2	X				
Baltimore oriole	B					2					
Bank swallow	M			M							
Barn swallow	M		SC	M		2					
Barred owl	B					2					
Bay-breasted warbler	B			HH	I	2	X				
Black-and-white warbler	B		SC			2					
Black-backed woodpecker	B			M	II						
Black-billed cuckoo	B			M	II	2					
Blackburnian warbler	B			M	II	2					
Blackpoll warbler	B			M	II						
Black-throated blue warbler	B			H	II	2					
Black-throated-green warbler	B			M	II	2					
Blue-gray gnatcatcher	M					2					
Blue-winged warbler	M		SC	H		1	X				
Bobolink	B			H	II	2					
Boreal chickadee	B			H	II						
Brown creeper	B			M							
Brown thrasher	B		SC			2					
Canada warbler	B		SC	HH	I	2	X				
Cape May warbler	B			H	I	2					
Chestnut-sided warbler	B		SC	H	II	2					
Chimney swift	M		SC	H	II	2					
Common nighthawk	B			H		2					
Eastern kingbird	B		SC			2					
Eastern meadowlark	M		SC			2					
Eastern towhee	M		SC			2					
Eastern wood-pewee	B		SC	H	II						
Evening grosbeak	YR		SC								
Field sparrow	B		SC			2					
Fox sparrow	M		SC								
Grasshopper sparrow	B		E			2					
Gray catbird	B				II						
Gray jay	B			M							
Great-crested flycatcher	B					2					
Least flycatcher	B		SC		II						
Long-eared owl	YR			H		2					
Marsh wren	B					2					
Nelson's sparrow	M		SC	HH	I	2	X				
Northern flicker	B			M		2					
Northern goshawk	B			M							

Species*	**Seasons on Refuge[1]**	**Federal T&E[2]**	**Maine T&E[3]**	**BCR 14[4]**	**PIF 27 and 28[5]**	**ME Comprehensive Wildlife Conservation Plan [6]**	**USFWS Birds of Conservation Concern[7]**	**Fish Species of Conservation & Mgmt. Concern[8]**	**Shorebird Plan-Atlantic Flyway[9]**	**Waterbird Plan[10]**	**Waterfowl Plan[11]**
Northern harrier	B		SC	M							
Northern parula	B			M	II	2					
Northern rough-winged swallow	M		SC								
Olive-sided flycatcher	B		SC	H	II	2	X				
Orchard oriole	M		SC								
Ovenbird	B			M	II						
Palm warbler	B			M							
Peregrine falcon	M		E	M		1	X				
Pine grosbeak	M			M	II						
Purple finch	B			H	II	2					
Purple martin	M		SC			2					
Red crossbill	YR					2					
Rose-breasted grosbeak	B			M	II	2					
Ruffed grouse	B			M	II						
Rusty blackbird	M		SC	H		2	X				
Scarlet tanager	B				II	2					
Sedge wren	M		E		II	1					
Short-eared owl	YR			M		1					
Spruce grouse	B			H	II						
Tennessee warbler	B		SC								
Tree swallow	B		SC								
Veery	B		SC	H	II	2					
Vesper sparrow	B			M		2					
Whip-poor-will	M		SC	M	II	2					
White-throated sparrow	B		SC								
Willow flycatcher	B					2					
Wood thrush	B		SC	HH	I	2	X				
Yellow-bellied flycatcher	B			M							
Yellow-bellied sapsucker	B			H	II	2					
Yellow-billed cuckoo	M		SC								
Yellow warbler	B		SC								
MAMMALS											
Hoary bat			SC								
Little brown bat			SC								
Red bat			SC								
Silver-haired bat			SC								
AMPHIBIANS											
Blue-spotted salamander	YR		SC								
Northern leopard frog	YR		SC								
Northern spring salamander	YR		SC								

Species*	Seasons on Refuge[1]	Federal T&E[2]	Maine T&E[3]	BCR 14[4]	PIF 27 and 28[5]	ME Comprehensive Wildlife Conservation Plan[6]	USFWS Birds of Conservation Concern[7]	Fish Species of Conservation & Mgmt. Concern[8]	Shorebird Plan-Atlantic Flyway[9]	Waterbird Plan[10]	Waterfowl Plan[11]
INVERTEBRATES											
Flat-headed mayfly			E								
Harpoon clubtail			SC								
Pygmy snaketail dragonfly			T			2					
Subarctic damer dragonfly			SC								
Tomah mayfly			T			1					
REPTILES											
Northern ribbon snake			SC								
Wood turtle			SC			2					
FISH											
American eel			SC			1		X			
American shad								X			
Atlantic salmon								X			
Bridle shiner			SC								
Brook trout						2		X			
Burbot						2					
FRESHWATER MOLLUSK											
Tidewater mucket			T								
Yellow lampmussel			T								

[1] Seasons on the Refuge: B=Breeding, M=Migration, YR=Year-Round
[2] Federal T&E = Federal Endangered Species List: T=Threatened, E=Endangered
[3] State T&E= State of Maine Threatened and Endangered Species List: T=Threatened, E=Endangered, SC=Special Concern
[4] BCR 14 = Bird Conservation Region 14: Atlantic Northern Forest; Blueprint for the Design and Delivery of Bird Conservation in the Atlantic Northern Forest (Dettmers 2006)
[5] PIF 27 and PIF 28: Partners in Flight Landbird Conservation Plan: Physiographic Area 27 – Northern New England (Hodgman and Rosenberg 2000) and Physiographic Area 28 – Eastern Spruce-Hardwood Forest (Rosenberg and Hodgman 2000).
[6] Maine State Comprehensive Wildlife Conservation Plan; Species priorities 1 (highest) and 2 (high)
[7] USFWS Birds of Conservation Concern for BCR 14 (USFWS 2008)
[8] Fish Species of Conservation and Management Concern, USFWS Northeast Region Fisheries Program, Strategic Plan Fiscal Years 2009-2013.
[9] Shorebird Plan-Atlantic Flyway = Clark and Niles 2000 North Atlantic Regional Shorebird Plan
[10] Waterbird Plan: James A. Kushlan, Melanie J. Steinkamp, Katharine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas. Washington, DC, U.S.A. H=High Risk, M=Moderate Risk, L=Low Risk, NR=Not Currently At Risk
[11] Waterfowl Plan: North American Waterfowl Management Plan: Strengthening the Biological Foundation: 2004 Strategic Guidance. Population Trends: I=Increasing, D=Decreasing, NT=No Trend

Appendix B

USFWS

Visitors paddle along Sunkhaze Stream at Sunkhaze Meadows National Wildlife Refuge

Findings of Appropriateness and Compatibility Determinations

Appropriate Use and Compatibility Determinations

Sunkhaze Meadows NWR

Compatibility Determination	Wildlife Observation and Photography, Environmental Education and Interpretation	B-1
Compatibility Determination	Fishing	B-18
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Findings of Appropriateness	Ice Skating	B-58
Findings of Appropriateness	Recreational Gathering	B-60
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Compatibility Determination	Privately-owned Recreational Cabin	B-89
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Compatibility Determination	Bicycling	B-95
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Findings of Appropriateness	Research Conducted by Non-Service Personnel	B-200
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Carlton Pond WPA

Compatibility Determination	Wildlife Observation and Photography, Environmental Education and Interpretation	B-210
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Findings of Appropriateness	Retriever Hunt Test and Field Trial	B-256
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Compatibility Determination	Boating	B-269

COMPATIBILITY DETERMINATION

USE: Wildlife Observation and Photography, Environmental Education and Interpretation

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-406k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." ((16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." ((16 U.S.C. 460k-1) (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resource and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What are the uses? Are they priority public uses?
The uses are wildlife observation, photography, environmental education, and interpretation. These four uses are among the six priority public uses of the National Wildlife 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 uses be conducted?
Wildlife observation, photography, environmental education and interpretation would be allowed to occur throughout the Sunkhaze Meadows National Wildlife Refuge (NWR, refuge), including the Sunkhaze Unit, Benton Unit, and Sandy Steam Unit, during open hours. Designated trails exist on the various units and most visitor use is focused on and around these trails. Visitors also use canoes or kayaks to access the various streams and other wetland areas within the refuge.

There is one elevated structure at the end of the Carter Meadow Trail to provide a panoramic view of the wetland, but no structures provided specifically as photography blinds, as none of the refuge's units have high concentrations of wildlife in a given location. The exact locations of environmental education and interpretation activities and events by outside groups would be at the discretion of the refuge manager through required special use permits (SUP).

(c) When would the uses be conducted?

Wildlife observation, photography, environmental education and interpretation would be allowed on all the units of the Sunkhaze Meadows NWR daily, year-round, from sunrise to sunset, unless a conflict with a management activity or an extenuating circumstance necessitates deviating from this. Closures for snow or ice storms, or other events affecting human safety, or for nesting season and other sensitive times of the year are examples of times when the refuge may require these uses be temporarily suspended or require temporary spatial closures of certain areas.

(d) How would the uses be conducted?

Refuge staff would be responsible for providing law enforcement; maintaining boundaries and signs; meeting with adjacent landowners and the interested public or responding to their inquiries; recruiting and supervising volunteers; preparing information on these uses to be delivered via Web sites, brochures, and other means; developing necessary signs; monitoring and evaluating impacts; regulating the use of the area by groups through SUPs; and, if sufficient staff exists, preparing and delivering environmental education and interpretation programs. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

(e) Why are these use(s) being proposed?

Wildlife observation, wildlife photography, environmental education, and interpretation are priority public uses as defined by 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). If compatible, they are to be facilitated on refuges. These uses would be conducted to provide compatible educational and recreational opportunities for visitors to enjoy the resources and to gain understanding and appreciation for fish and wildlife and habitats, ecology and wildlife management. These uses provide opportunities for visitors to relax and enjoy wildlife in a wholesome, safe, unstructured outdoor environment at their own pace, and to provide the psychological and health benefits attendant to that type of outdoor enjoyment. As visitors enjoy the recreational aspects of these activities, they may be drawn to engage in the more structured educational opportunities offered, and thereby, enhance their understanding of natural resource management programs and ecological concepts. This, in turn, would enable them to better understand ecological issues and problems affecting refuge resources and become better advocates and stewards for those resources. Photographs that are taken on refuges are sometimes shared with others by the photographer or shared with the refuge staff and donated for use in U.S. Fish and Wildlife Service outreach materials and can provide the public increased exposure to refuge assets.

AVAILABILITY OF RESOURCES:

Sufficient refuge resources in terms of personnel and budget are available to administer these uses.

Cost Breakdown
The following are estimated costs to the refuge to administer and manage the refuge programs for wildlife observation, wildlife photography, environmental education, and interpretation.

Maintenance:	$5,000	annually to maintain kiosks, trails and parking lots
Install improved signs:	$3,000	one-time expense
Monitoring:	$2,000	annual
Law Enforcement:	$6,000	annual
Total:	**$16,000**	

ANTICIPATED IMPACTS OF THE USE:

Wildlife observation and photography, environmental education, and interpretation can have positive or negative impacts to the refuge's wildlife and habitats.

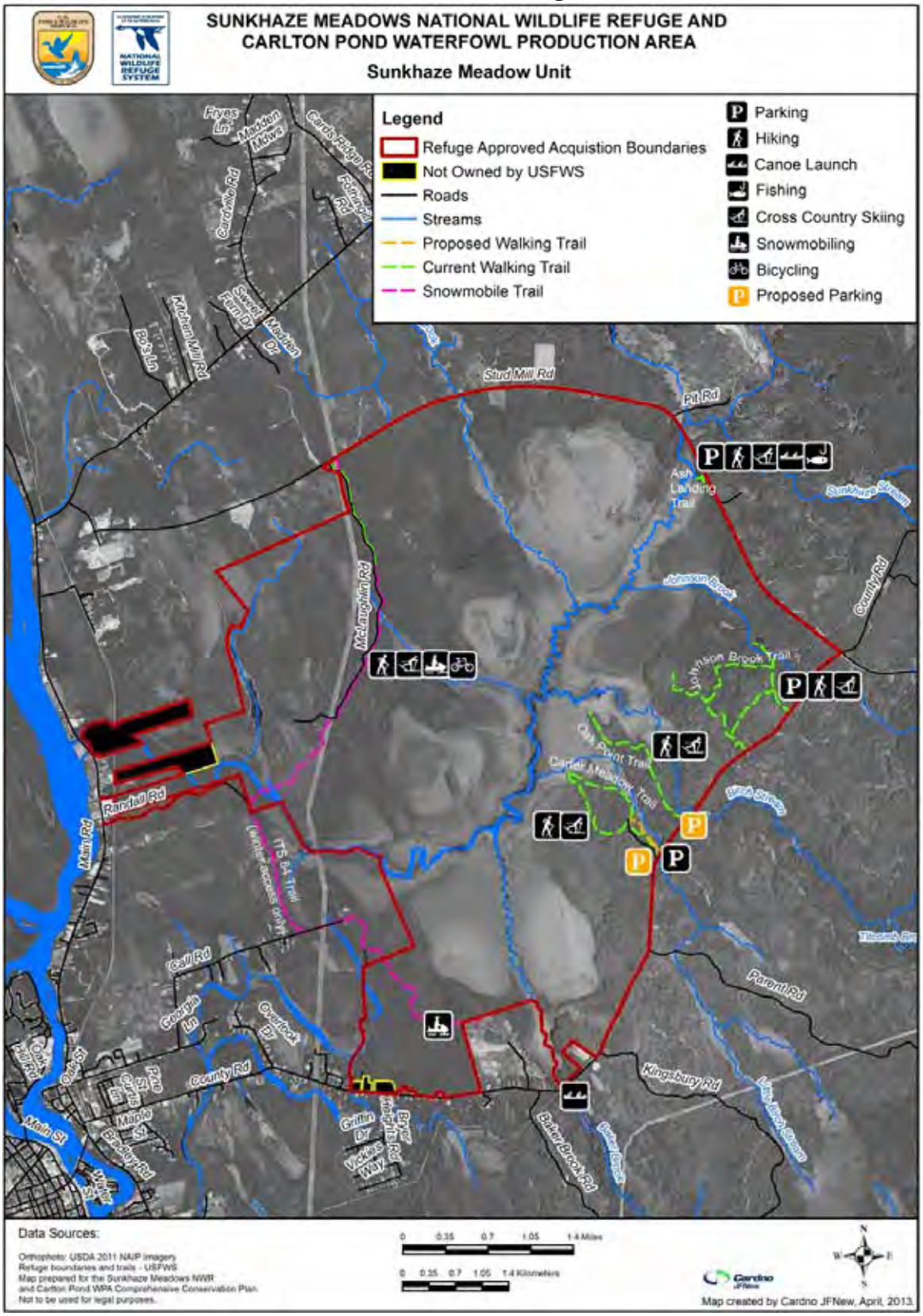
In general, visitors engaged in these uses will be traveling by foot, either by walking or hiking, in designated areas and along designated trails and roads. The positive impacts of these uses include providing visitors with a better appreciation and more complete understanding of the wildlife and habitats associated with the refuge. This can translate into more widespread and stronger support for the refuge, the National Wildlife Refuge System, and the Service, as well as wildlife conservation in general.

The negative effects of these uses include impacts to plants, soils, hydrology, and wildlife from both visitors walking and hiking on the refuge and from building and maintaining public use facilities.

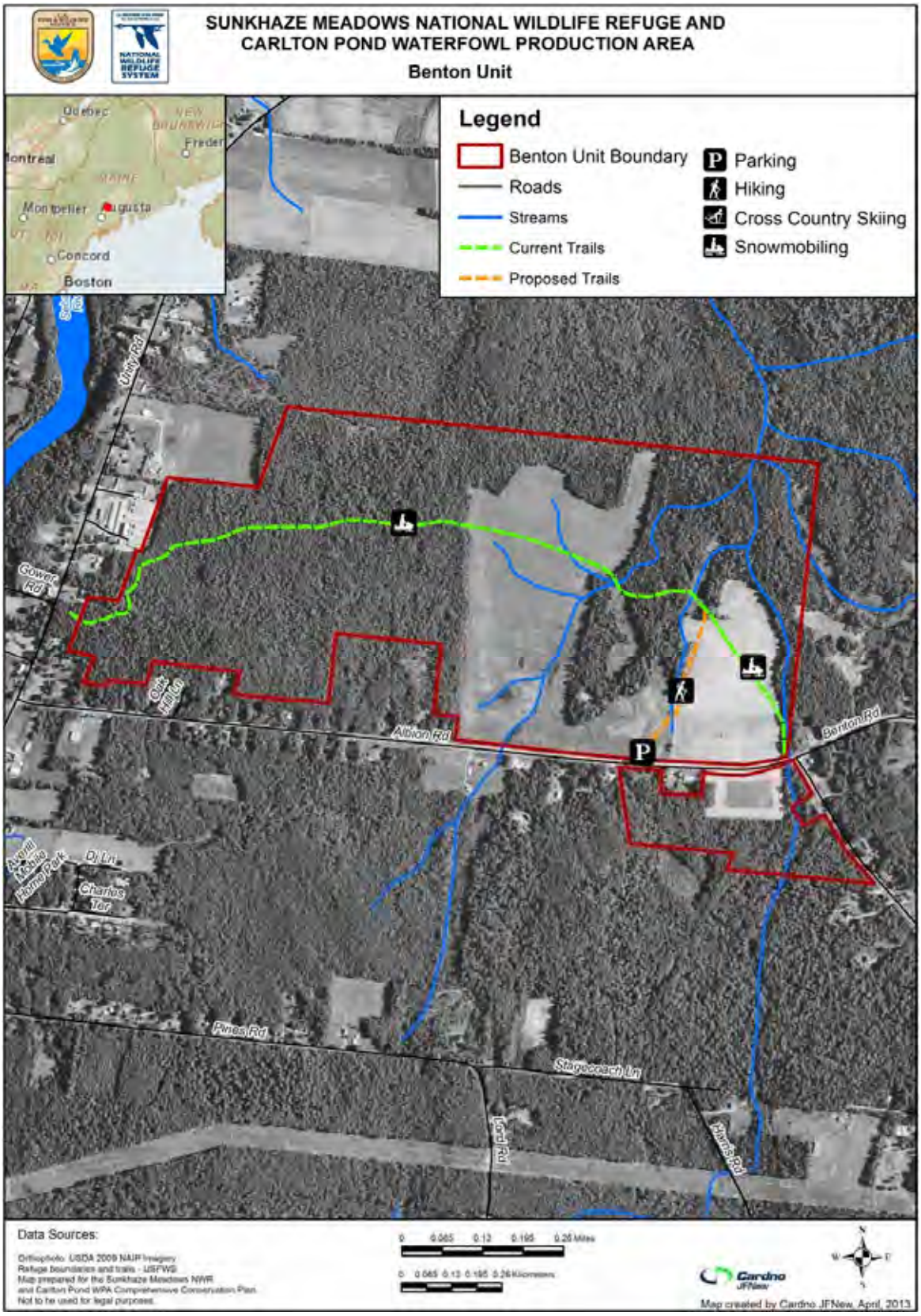
Vegetation Impacts:
Pedestrian travel can have indirect impacts to plants by compacting soils and diminishing soil porosity, aeration, and nutrient availability that affect plant growth and survival (Kuss 1986). Hammitt and Cole (1998) note that compaction limits the ability of plants to re-vegetate 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.

It is anticipated that allowing this use would cause vegetation loss on designated routes. Foot travel may increase root exposure and trampling effects; however, refuge staff have only observed minimal impacts to refuge vegetation associated with current use because most visitors remain on established roads and trails. Designated routes for pedestrian travel consist of existing trails, many with hardened surfaces or are existing trails that have been used for many years.

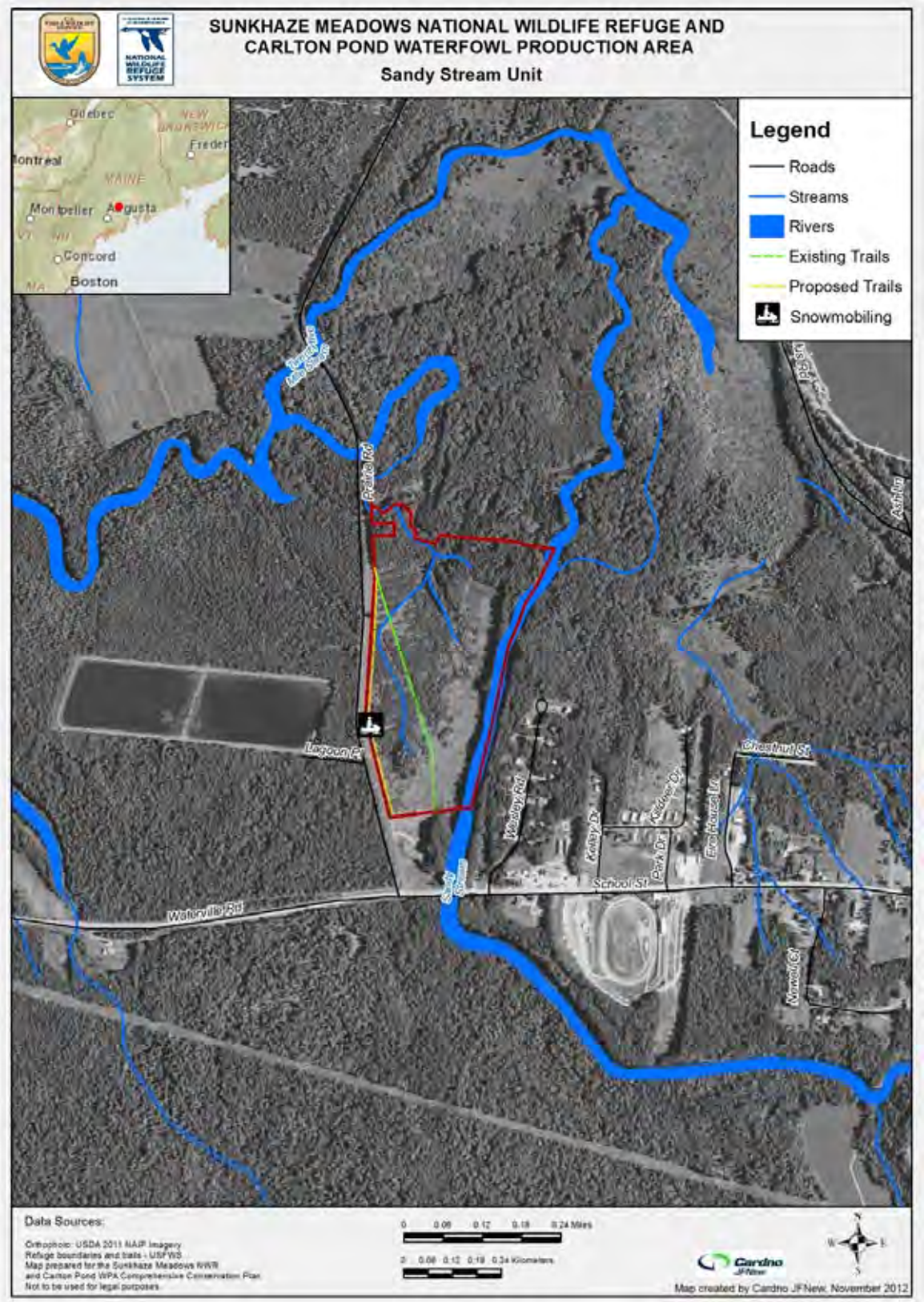
Map B.1. Current and proposed public use infrastructure within the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.2. Current and proposed public use infrastructure within the Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.3. Current and proposed public use infrastructure within the Sandy Stream Unit of Sunkhaze Meadows National Wildlife Refuge.



For these reasons, we expect only negligible increases in impacts to this resources associated with the projected moderate increase in use. Refuge staff would monitor trails and refuge lands. If any problem areas are identified, we would take the appropriate restoration and protection measures.

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.

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 will 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.

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. Under current 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.

Since all the units of the refuge are fairly flat, erosion is not a large problem, but impacts to wet areas can occur when bridging is inadequate and visitors widen or go off the trail to avoid wet spots. Properly sited, designed, and maintained trails minimize this impact. Based on the current level 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.

Habitat Impacts:
Peatlands are particularly vulnerable to damage by visitors who may walk through them or collect plants. At Sunkhaze Meadows NWR, the peatlands are difficult to access due to the large area of wetlands that exist between the streams and the peat domes; there are no designated trails to access these sensitive areas. Plant collecting is also prohibited. Visitors wishing to see a bog can visit the boardwalks that access the nearby Orono Bog.

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 Knight1998), 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. 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.

Impacts on Birds

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 wildlife observation, photography, environmental education, and interpretation 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 (*Egretta 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, will 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).

Impacts on Other Wildlife

Adverse effects to wildlife have been shown to be directly proportional to increases in the number of users (Beale and Monaghan 2004). According to the study, groups of visitors using trails were more likely to cause behavioral changes in the animals studied when compared to individual visitors.

Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). There is evidence to suggest that species most likely to be adversely affected are those where available habitat is limited, constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 2001).

Lenth et al. (2006) found, in areas that prohibited dogs, mule deer were less active up to 50 meters from recreational trails. In areas that allowed dogs, mule deer showed reduced activity within at least 100 meters of trails. While the refuge does not have mule deer, this may hold true for white-tailed deer as well. The same study found similar adverse effects for small mammals including squirrels, rabbits, chipmunks, and mice. This means that there is a certain area around recreational trails that becomes unsuitable habitat for certain wildlife species, even though the habitat would otherwise be suitable (Lenth et al. 2006).

Wildlife disturbance may be compounded by seasonal needs. For example, causing mammals to flee during winter months could 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.

While little information is available on human disturbance and reptiles and amphibians, it is possible that visitors participating in wildlife observation, photography, environmental education, and interpretation may have adverse effects on these species. Because of their small size and tendency to hide under vegetation, visitors may not be aware of these species until they flee. Visitors may inadvertently injure or kill individuals when walking on or off-trail. Most of these species on the refuge are wetland species, which are areas typically avoided by visitors (except by boat) because of problems accessing these areas. Because these species are dormant in winter months, visitors are not likely to disturb them during this season.

Overall adverse impacts to mammals, reptiles, and amphibians are expected to minimal. Refuge use is currently low and increases in use would be monitored by Service staff to ensure impacts to wildlife are minimal. Most of the use is spread out over the 11,484-acre Sunkhaze Meadows Unit, the largest refuge unit. This minimizes potential adverse impacts to wildlife. Most visitors participating in these activities are alone, or in small groups (less than 10 people). Organized

environmental education or interpretation activities (e.g., nature walks, canoe trips) are more likely to involve larger groups. Because larger groups are more likely to disturb habitats and wildlife, we would require program leaders to obtain a SUP prior to conducting the event. This would allow us to collect specific information on the number of people involved, the type of event or program, limit locations for the activity (if needed), and include any other stipulations that may be warranted to protect refuge resources.

Summary of Impacts:
Specifically at Sunkhaze Meadows NWR, no impacts are expected on any threatened or endangered species, whether federally listed or State-listed. Trail use may discourage animal use of habitat very close to the trails, but the area impacted by trails is small compared to the area available to wildlife away from any trail Overall, effects should not be significant since the units of the refuge all experience a low level of public use and we anticipate only moderate increases over the next 15 years.

Based on observations and knowledge of the areas involved, there is no evidence that cumulatively, the proposed wildlife-dependent uses would have an unacceptable effect on the refuge resources. Although a substantial increase in the cumulative impacts from public use is not expected in the near term, it would be important for refuge staff to monitor use and respond, if necessary, to conserve the existing high quality wildlife resources.

No additional effects from wildlife observation, wildlife photography, environmental education, and interpretation area anticipated. Therefore allowing these uses poses only minimal threats to goal 1 of the CCP, "Promote the biological integrity, diversity, and environmental health of the Sunkhaze Meadows Unit's wetland, forest, and aquatic habitats to protect water quality and sustain native plant communities, rare plants, and wildlife, including species of conservation concern." In addition, these uses help fulfill goal 4 of the CCP.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment (EA).

DETERMINATION (check one below):

This use is compatible __x__
This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

On refuge lands:

- Refuge staff would continue to monitor the refuge for the presence of threatened or endangered species, and ensure that unusual or critical conditions relative to habitat or

disturbance are not present. If conditions dictate, uses of all or any part of the area may be temporarily suspended by posting.

- Periodic law enforcement would ensure compliance with regulations and area closures and discourage prohibited activities and vandalism.

- Outside individuals, groups, or organizations wishing to visit the refuge to provide environmental education or interpretation activities would be required to obtain a SUP. This would allow the refuge staff to provide important information about access, resources, and specific stipulations to reduce disturbances that may be caused by groups compared to individuals. It would also help the refuge quantify and monitor these uses on the refuge.

JUSTIFICATION:

Wildlife observation, wildlife photography, environmental education, and interpretation are priority public uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife resources (Executive Order 12996, March 25, 1996, and The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997). The Service's policy is to provide opportunities for these uses when compatible and consistent with sound fish and wildlife management.

Allowing wildlife observation and photography, environmental education and interpretation on Sunkhaze Meadows NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. These uses would not materially interfere with or detract from the wildlife and habitat protection aspects of the purposes because at the scales and level of current visitor use, wildlife and habitats are not appreciably negatively affected by these uses. We have made this determination based on lack of observed habitat degradation and because disturbance to wildlife would be short term, use is focused around established trails, and the trails that are used for these activities are designed to protect sensitive resources. Wildlife observation, photography, environmental education, and interpretation would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species that occur on the refuge. Therefore, no significant adverse effects from wildlife observation, photography, and environmental education or interpretation are anticipated. Allowing these uses supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013) and the refuge's purpose associated with allowing wildlife-oriented recreational opportunities. These activities would not materially interfere with or detract from the mission of the Service, because providing these wildlife-dependent recreational opportunities is a focus of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 15-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male song sparrows. Animal Behavior 35:773-784.

Batten, L.A. 1977. Sailing on reservoirs and its effects on water birds. Biological Conservation 11:49-58.

Beale, C.M. and P. Monaghan. 2004. Human disturbance: people as predation-free predators? Journal of Applied Ecology 41: 335-343.

Belanger, L. and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36-41.

Boyle, S.A. and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation.

——— 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. Biological Conservation 13:123-130.

Burger, J. and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. Journal of Comparative Physiological Psychology 95:676-684.

——— 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. Environmental Conservation 22:56-65.

Butler, J.R. 1984. The myths, the reality, and the challenges of managing for the non-consumptive wildlife user. *In* W.C. McComb, editor and compiler. Proceedings of the Workshop on Management of Nongame Species and Ecological Communities. University of Kentucky, Department of Forestry, Lexington, Kentucky. 404 pp.

Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. American Birds 34: 206-208.

Carlson, L.H. and P.J. Godfrey. 1989. Human impact management in a coastal recreation and natural area. Biological Conservation.

Cassirer, E.F., D.J. Freddy, E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. *In:* Hendee, J.C., G.H. Stankey, R.C. Lucas. eds., Wilderness Management.

Cole, D.N. and P.B. Landres. 1995. Indirect effect of recreation on wildlife in Knight, R.L, and K.J. Gutzwiller, eds. 1995. Wildlife and Recreationists—Coexistence Through Management and Research. Washington, DC. Island Press.

Dearden, P. and C.Hall. 1983. Non-consumptive recreation pressures and the case of the Vancouver Island marmot (*Marmota vancouverensis*). Environmental Conservation.

Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation 18:39-51.

Ewald, P.W. and F.L Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31:277-292.

Ferguson, M.A.D. and L.B. Keith. 1982. Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. Canadian Field-Naturalist.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and in snowmobiles. Wildlife Society Bulletin 14: 63-68.

Goff, G.R., D.J. Decker, G. Pomerantz. 1988. A diagnostic tool for analyzing visitor impacts on wildlife refuges: a basis for a systematic approach to visitor management. Transactions of the Northeast Section of the Wildlife Society.

Goodrich, J.M. and J. Berger. 1994. Winter recreation and hibernating black bears *Ursus americanus*. Biological Conservation.

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of human intrusion on son occurrence and singing consistence in subalpine birds. The Auk 111(1):28-37.

Hall, D. and P. Dearden. 1984. The impact of non-consumptive recreation on wildlife: an annotated bibliography.

Hammitt, W.E. and D.N. Cole. 1998. Wildland Recreation. John Wiley & Sons, New York, 361 pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Henson, P.T. and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin 19:248-257.

Kaiser, M.S. and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Klein, M.L. 1989. Effects of high levels of Human Visitation on Foraging Waterbirds at J.N. “Ding” Darling NWR, Sanibel, Florida. Final Report to USFWS. 103 pp.

——— 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454-1465.

Knight, R.L. and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. *In:* Glinski, R.L., B.G. Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, S.W. Hoffman, C.E. Ruibal, D.L. Krahe, D.L. Owenseds., Proceedings of the southwest raptor management symposium and workshop.

Knight, R.L. and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Trans. 56th National Association of Wildlife and Natural Resources Conference. Pp. 238-247.

——— 1995. Wildlife responses to recreationists. Pp. 51-69 in: Knight, R.L. and K.J. Gutzwiller eds., Wildlife and recreationalists: coexistence through management and research. Island Press, Washington, DC. 372 pp.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kuss. F. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management. 10:638-650.

Kuss, F.R. and A.R. Graefe. 1985. Effects of recreation trampling on natural area vegetation. Journal of Leisure Research.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pp. 249-297 in: A. Sprunt IV, J.C. Ogden, and S. Winckler, eds., Wading Birds. National Audubon Society, New York, New York.

Lenth, B., M. Brennan, and R.L. Knight. 2006. The effects of dogs on wildlife communities. Natural Areas Journal 28: 218-227.

Marion, J.L. and D.W. Lime. 1986. Recreational resource impacts: visitor perceptions and management responses. In: Kulhavy, D.L. and R.N. Conner eds., Wilderness and natural areas in the Eastern United States: a management challenge.

McNeil, R., P. Drapeau, and J.D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. Biological Review 67:381-419.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

——— 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.

More, T.A. 1979. The demand for nonconsumptive wildlife uses: a review of the literature.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53: 401-410 (also see corrigendum in Journal of Wildlife Management 54:683).

Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, N.A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130

Rodgers, J.A. and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

———. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: a handbook for trail planners. Colorado State Parks, Denver, CO. 51pp.

U.S. Fish and Wildlife Service (USFWS). 1988. Final environmental assessment, proposal to establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge preliminary station management plan.

———1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

Van der Zande, A.N., J.C. Berkhuizen, H.C. Van Latesteijn, W.J. Ter Keurs, and A.J. Poppelaars. 1984. Impact of outdoor recreation on the density of a number of breeding bird species in woods adjacent to urban residential areas. Biological Conservation.

Vaske, J.J., A.R. Graefe, and F.R. Kuss. 1983. Recreation impacts: a synthesis of ecological and social research. Transactions of the North American Wildlife and Natural Resource Conference 48:96-107.

Ward, D.H. and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D. and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J. and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

COMPATIBILITY DETERMINATION

USE: Public Fishing

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is public fishing, a priority public use of the National Wildlife 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?
The use would be conducted on and from the banks of all refuge bodies of water that are open to fishing including Baker Brook, Birch Stream, Buzzy Brook, Dudley Brook, Johnson Brook, Little Birch Stream, Little Buzzy Brook, Sandy Steam, and Sunkhaze Stream. Since many of these banks are relatively inaccessible, we expect that fishing from banks would be concentrated where these streams intersect County Road or Stud Mill Road. Fishing may also be conducted by fishermen in waders walking in the waterways, and from boats in those brooks and streams that are navigable.

(c) When would the use be conducted?
The use would be conducted during the seasons specified in the fishing regulations of the State of Maine and would occur between the hours of sunrise and sunset.

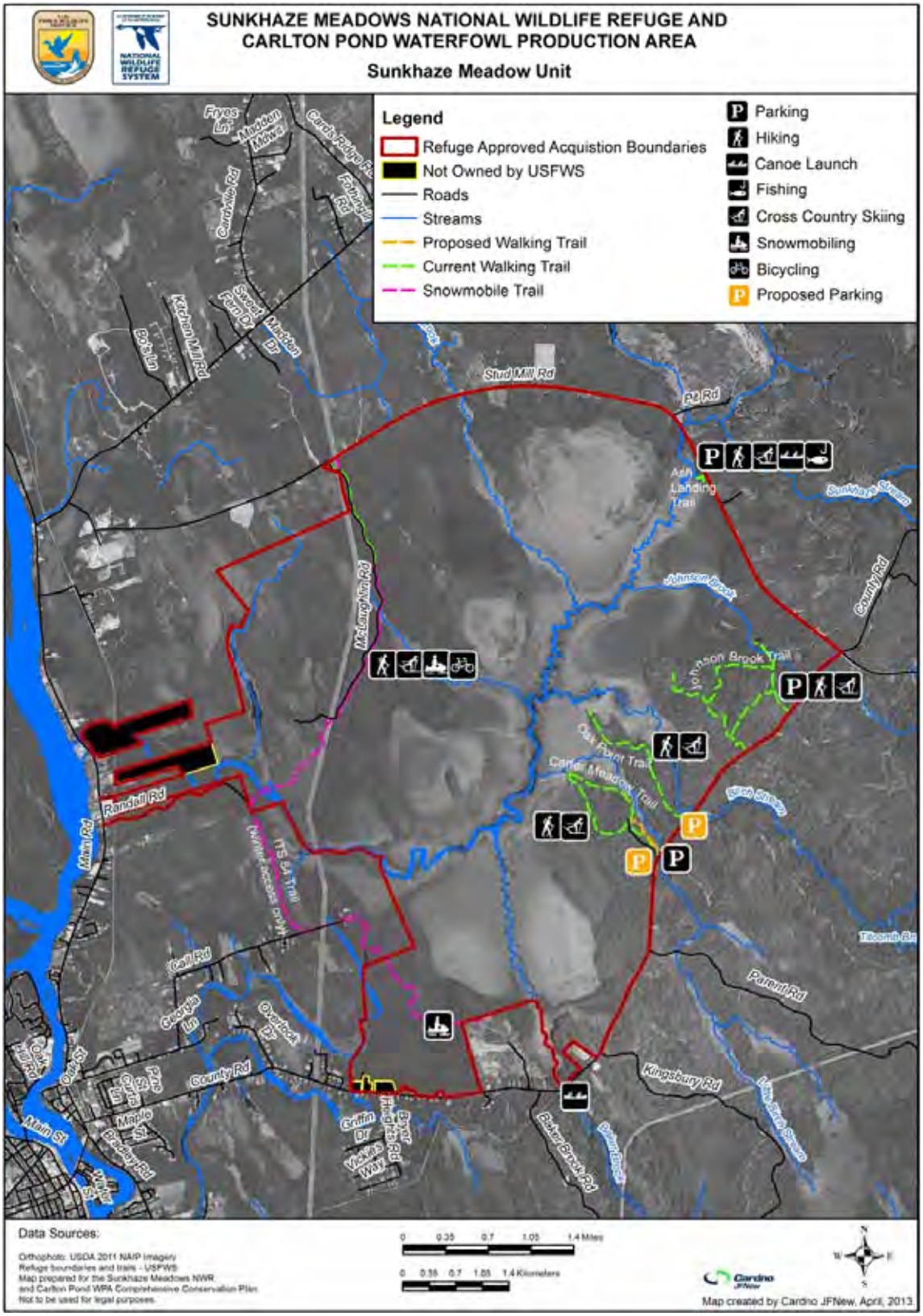
(d) How would the use be conducted?
The use would be conducted under Maine State fishing regulations for open water and ice-fishing, with some additional restrictions, discussed below, to protect fish, wildlife, and habitat, and to reduce potential public use conflicts. A valid State of Maine fishing license would be required to fish on the refuge. This compatibility determination applies to both shoreline fishing and fishing from motorized and non-motorized boats. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

Public boat launches are available at Ash Landing located off the Stud Mill Road and off Route 2 in Milford along the Penobscot River. Prior to launching the public should inspect motor boats and trailers and clean them of aquatic invasive species before launching. Maine Statute Title 38: 419B- 420 prohibits the transport of any aquatic plant or parts of any aquatic plant, including roots, rhizomes, stems, leaves or seeds, on the outside of a vehicle, boat, personal watercraft, boat trailer or other equipment on a public road. Cleaning of boats should take place on dry ground well away from the water. Exotic, nuisance plants or animals on boats, trailers, diving equipment, or in bait buckets can disrupt aquatic ecosystems and negatively impact native fish and plant species. Sunkhaze Meadows and its associated tributaries appear to be relatively free of aquatic invasive plants, and cleaning of boats, trailers, and other equipment would help keep them that way. Signs, education, and periodic courtesy checks would help prevent the spread of invasive aquatic plants. Unauthorized introductions of both nonnative and native fish can also significantly disrupt aquatic ecosystems and destroy natural fisheries. No fish of any species may be introduced into refuge waters without appropriate State and refuge permits. This includes unused bait fish and eggs. Bait fish may be trapped by State regulation from refuge waters for personal use, but not for commercial purposes.

At the discretion of the refuge manager, some areas may be seasonally, temporarily, or permanently closed to fishing, if wildlife or habitat impacts or user conflicts become an issue. In cooperation with State fisheries biologists, we may manipulate the fisheries or habitat to promote or improve the fishery resource, if warranted. That may include changing fishing regulations (season dates, creel limits, and methods of take), introducing or removing fish barriers, manipulating instream or streambank habitat, and designating riparian buffers. Lead fishing sinkers or jigs would not be permitted on the refuge due to the potential for the lead to poison loons, waterfowl, and other waterbirds.

(e) Why is the use being proposed?
The use is being proposed to accommodate one of the priority public uses of the Refuge System. We have the opportunity to provide public fishing opportunities in a manner and location that would offer high-quality, wildlife-dependent recreation and maintain the level of current fish and wildlife values.

Map B.4. Streams and Trails for the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



AVAILABLITY OF RESOURCES:

Facilities or materials needed to support fishing include annual review of the refuge fishing plan, signing and monitoring of fishing access points, and law enforcement patrols. The refuge also plans to upgrade the hand carry boat launch and access trail at Ash Landing which is a funded project in the 2012 budget and would be a 1-year cost.

Upgrade parking area and trail to Ash Landing boat launch:	$7,000
Annual review of fishing plan:	$450
Signing and monitoring fishing access sites:	$300
Law enforcement patrol:	$3,600
Program Cost:	**$11,350**

ANTICIPATED IMPACTS OF THE USE:

Fishing is consistent with the purposes of the refuge when carried out within established regulations and is a priority use identified in the Refuge Improvement Act. Some wildlife disturbance is created by fishing activity. Disturbance during the summer is limited to waterfowl, shorebirds, aquatic species, and marsh and wading birds.

The Sunkhaze Meadows Unit provides habitat for both warm water and coldwater fish species, although it is primarily warm water fish habitat (table B.1). Smithwood and McKeon (1999) compiled a list of 17 fish species as part of a fisheries management plan. Included in this list is Atlantic salmon, which has been reported entering the lower reaches of Sunkhaze Stream from the Penobscot River during warmer summer months. The Penobscot River is a major migratory pathway for Atlantic salmon. Brook trout and American eel are native to the Sunkhaze Stream system, while smallmouth bass were introduced sometime prior to the 1940s. Smithwood and McKeon (1999) found no data that blueback herring or alewife ever inhabited the refuge waters.

The primary brook trout habitat on the refuge appears to be a reach of Sunkhaze Stream from Stud Mill Road extending 200 meters downstream. During warm periods of the year they appear to move farther upstream. Brook trout are also found in Little Birch Stream. Nearly 40,000 brook trout were released into Sunkhaze Stream between 1940 and 1950, and another 500 were stocked in Sunkhaze and Birch Streams from 1974 to 1975, the last year that any fish were stocked on lands now encompassed by the refuge. The stocking period coincided with heavy fishing pressure, especially on brook trout (Smithwood and McKeon 1999).

Table B.1. Fish species captured on Sunkhaze Meadows Unit during summer 1997 (from Smithwood and McKeon 1999).

Species	Sunkhaze Stream			Birch Stream	Little Birch Stream
	Section 1	Section 2	Section 3		
American eel				X	
Blacknose dace				X	
Brook trout					X
Brown bullhead		X			
Burbot				X	X
Chain pickerel	X	X	X		
Creek chub				X	X
Fallfish	X	X	X	X	
Golden shiner		X	X		
Pumpkinseed		X	X		
Redbreasted sunfish		X			
Smallmouth bass	X	X			
White sucker	X	X	X	X	
Yellow perch	X	X	X		

A study of fish assemblages in the Penobscot River and some tributaries by Kiraly et al. (2011) included sampling of Sunkhaze Stream. The researchers used electro shocking from boats to measure the dominant fish species. For Sunkhaze Stream the dominant fish were golden shiner, brown bullhead, and pumpkinseed. Other species that were captured during the study included redbreast sunfish, yellow perch, chain pickerel, and common shiner.

Potential impacts of public fishing on the refuge follow:

Impacts on Fish Species:

Recreational fishing by the public can have negative impacts on fish populations if it occurs at high levels or is not managed properly. Potential impacts from fishing include direct mortality from harvest and catch and release; injury to fish caught and released, changes in age and size class distribution, changes in reproductive capacity and success, loss of genetic diversity, altered behavior, and changes in ecosystems and food webs (Lewin et al. 2006, Cline et al. 2007).

These impacts are often disproportionate among fish species, sizes, ages, sexes, and based on other behavioral traits because anglers selectively catch fish based on these factors (Lewin et al. 2006). In general, anglers tend to target larger and older fish. The selective removal of larger and older fish can have a variety of impacts of fish population dynamics. First, it can decrease the age and size class distribution in fish populations. Second, larger and older fish tend to have greater reproductive capacity because they are better able to compete for spawning areas and

generally have higher egg outputs. Because of this, their selective removal may reduce the populations overall reproductive success. Depending upon the species, anglers may also be more likely to catch males (e.g., some male largemouth bass are more aggressive towards lures) or females (e.g., in some species females grow faster). Also, fish that are more active during the day are often more vulnerable to being caught (Lewin et al. 2006).

Catch-and-release fishing can also have impacts on individual fish, including immediate or delayed mortality. The likelihood of mortality is related to the type of fishing gear used, where the fish is hooked, how the fish is handled, angler experience, and environmental conditions. In general, circle hooks tend to cause less damage than barbed hooks. Also, fish hooked in the lips or jaws tend to have minimal mortality as compared to fish hooked in the gills, esophagus, intestine, or eyes. Fish caught and released with nonlethal injuries may also be exposed to parasites, or bacterial or fungal infections. Individuals that are caught and then handled may also experience stress, which can lead to changes in physiology and behavior which can in turn impact their growth, reproduction, and immune system (Lewin et al. 2006).

Since fishing generally removes individuals from a population, at high levels it can lead to reduced population sizes and loss of genetic diversity. The loss of genetic diversity can ultimately reduce a population's fitness, resilience, and ability to adapt to environmental changes and stressors, such as climate change. The higher the fishing mortality, the greater these types of impacts would be (Lewin et al. 2006).

While fishing does remove individuals from the population, we do not anticipate that current or projected fishing pressure would affect the refuge's fish populations as a whole. The State sets catch limits, designated waters, and fishing seasons to protect the State's fish populations. Sunkhaze Stream and its tributaries are dominated by warm water species (Kiraly 2012). Fish species usually sought are smallmouth and largemouth bass. While popular with anglers, smallmouth and largemouth bass are not native to Maine (MDIFW 2001). According to Maine Department of Inland Fisheries and Wildlife (MDIFW), there has been an increase of 47 percent in the number of lakes with one or more species of bass between 1980 and 2000 (MDIFW 2001). Given the distribution of these species and the State's estimates of abundance, we do not expect fishing pressure at Sunkhaze Meadows NWR to have adverse effects on these species.
Illegal take can also impact fish populations. Our refuge officer in cooperation with Maine State game wardens would continue to periodically patrol the refuge to help reduce illegal take.

Impacts on Other Wildlife:
Since fishing occurs along and in wetland areas, it has the greatest potential to impact aquatic and semi-aquatic species in refuge fishing areas. In particular, fishing has the potential to disturb waterfowl and waterbird species. Fishing seasons in Maine coincide in part with spring-early summer nesting and brood-rearing periods for many species of aquatic-dependent birds. Anglers can also affect the number, behavior, and temporal distribution of some species of birds, including bald eagles, common ravens, and American crows (Knight et al. 1991). Human activity, including both walking along trails and boat use, has the potential to affect the distribution, abundance, and species richness of water birds by disturbing birds that are overwinter, resting, foraging, reproducing, and nesting.

Disturbance from recreational activities vary with the wildlife species involved and the activity's type, level, frequency, duration, and the time of year it occurs. The responses of wildlife to human activities include avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Kahl 1991, Klein 1993, Whittaker and Knight 1998), the use of suboptimal 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, Whittaker and Knight 1998), attraction (Whittaker and Knight1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Anglers and other boaters may disturb nesting birds by approaching too closely to nests, causing nesting birds to flush. Flushing may expose eggs to predation or cooling, resulting in egg mortality. If this becomes a problem we would close refuge areas seasonally to fishing and boating around sensitive nest sites, in conjunction with the state of Maine if necessary. Most boating is non-motorized at this time which significantly reduces potential impacts.

Visitors to the refuge engaged in fishing would generally be walking along refuge trails and roads or using motorized or nonmotorized boats in refuge ponds and lakes. A study by Miller, Knight, and Miller (1998) indicates that species composition and nest predation was altered adjacent to trails in both forested and grassland habitats. It appears that species composition changes are due to the presence of humans and not the trail or roadway itself. On the other hand, nest predation does appear to be a function of the trail which allows access to mammalian nest predators. Several studies have examined the effects of recreationists on birds using shallow-water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981, Burger 1986, Klein 1993, Klein et al. 1995, Rodgers and Smith 1995, Rodgers and Smith 1997, Burger and Gochfeld 1998).Overall, the existing research clearly demonstrates that disturbances from recreation activities have at least temporary effects on the behavior and movement of birds within a habitat or localized area.

The use of boats, particularly motorized boats, for fishing can also have impacts on fish and other species. Potential impacts include direct impacts, such as mortality from waves and propeller action, and indirect impacts, including increased stress levels, increased water turbidity, loss of food sources, and the dislodging of eggs and larvae from their substrate. Motorized boats can also disturb wildlife by creating loud noises, which may interfere with hearing, and by releasing toxic inorganic and organic compounds into the water and air (Lewin et al. 2006).

Lost fishing tackle may harm waterfowl, eagles, and other birds externally by catching and tearing skin. Fishing line may also become wrapped around body parts and hinder movement (legs, wings), impair feeding (bill), or cause constriction with subsequent reduction of blood flow and tissue damage. An object above or below the water surface may snag entangled animals, from which they are unable to escape. Nineteen percent of loon mortalities in Minnesota were attributed to entanglement in fishing line (Ensor et al. 1992). Entanglement in fishing line has also caused mortality in bald eagles. Birds may also ingest sinkers, hooks, floats, lures, and fishing line. Ingested tackle may cause damage or penetration of the mouth or other parts of the digestive tract, resulting in impaired function or death. Lead tackle is particularly toxic to wildlife. An investigation into causes of mortality in loons in New England found 52 percent of loon carcasses submitted to Tufts University Wildlife Clinic had died of lead poisoning from ingestion of lead sinkers (Pokras and Chafel. 1992). Maine law prohibits the sale of lead sinkers

that weigh less than 0.5 ounces (Maine Title 12, part 13, subpart 4, chapter 923, subchapter 5, 12663-A), and the Service prohibits the use of any lead fishing sinkers or jigs on the refuge. The refuge and the State would continue to provide education and outreach on the hazards of lead sinkers and discarded fishing tackle. Our refuge officer would help in that public outreach.

Water Quality Impacts

Pollutants from motorboats, human waste, and litter have the potential to have negative impacts on water quality. Extensive water quality testing on Sunkhaze Stream and its tributaries has not been carried out. As such, the levels of pollutants from boat fuel and impacts on local aquatic systems are unknown. Hydrocarbon contamination can be harmful to fish; however, because of the size of the stream and limited access most boating on the refuge is currently non-motorized so we believe there is little contamination coming from this source. We would initiate public outreach and education on littering, pollutants, and proper waste disposal if the use increases substantially above current use levels to help mitigate water quality impacts. Water quality testing would be carried out as funding levels permit.

Bank and trail erosion from human activity (boat landings, boat wakes, foot traffic) may increase aquatic sediment loads of streams and rivers, or alter riparian or streamside habitat/ vegetation in ways harmful to fish or other wildlife. Boat access would be restricted to designated areas only. The trail to the Ash Landing boat launch would be 'hardened' to further reduce any erosion potential. Wetlands guard much of the refuge shoreline, making it extremely difficult to access for shore-based fishing. We do not intend to construct any new trails or boardwalks to provide shore-based fishing access. Therefore, at current levels of use, we do not expect trail erosion to increase because of foot traffic related to fishing. 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, therefore we do not anticipate any significant bank erosion due to boat wakes.

Other Impacts:

Accidental or deliberate introductions of nonnative fish that may negatively impact native fish, wildlife, or vegetation. The refuge would continue to work cooperatively with the State in providing educational outreach and signs on preventing introductions of nonnative fish and try to contain introductions if they occur.

Accidental introduction of invasive plants, pathogens, or exotic invertebrates, attached to fishing boats may also impact native vegetation, wildlife, and habitats. With the exception of a few isolated occurrences of purple loosestrife, refuge waters appear to be relatively free of invasive aquatic plants and mollusks. However, we have not carried out extensive surveys of aquatic invasives. We can mitigate the potential for introductions by having boaters clean their boats before launching and after retrieving. We would also post launch sites with educational materials and have law enforcement officers make spot checks of vessels for compliance and to educate boaters on proper methods for checking for aquatic hitchhikers.

The 2011 national survey of fishing, hunting, and wildlife-associated recreation reveals that 341,000 Maine residents and nonresidents 16 years old and older fished in Maine (USFWS 2011). Sunkhaze Meadows Refuge was a destination for some of this wildlife-dependent

recreation. Visitors fishing on the refuge benefit the local economy by purchasing gas, food, fishing equipment, and lodging.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination would undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Fishing access areas where streams intersect roads have been designated and signed.
- All boats, trailers, motors, and fishing gear would be encouraged to be inspected by the owner for plant material and cleaned prior to launching and after retrieval.
- Compliance with regulations would be achieved through education, signage and law enforcement which would result in minimizing negative impacts to refuge habitat and wildlife.
- No commercial fishing or collecting bait for commercial purposes is allowed.
- Maine law prohibits the sale of lead sinkers weighing less than 0.5 ounces (Maine Title 12, part 13, subpart 4, chapter 923, subchapter 5, 12663-A). Use of any lead fishing sinkers or jigs is prohibited on the refuge.
- The refuge would be open to fishing during regular refuge hours, sunrise to sunset.

JUSTIFICATION:

Fishing is a priority public use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife resources (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997). The Service's policy is to provide opportunities for this use when compatible and consistent with sound fish and wildlife management. Fishing is also a popular, traditional recreation activity in Maine that is strongly supported by the Maine Department of Inland Fisheries and Wildlife.

Allowing fishing at Sunkhaze NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, fishing is a wildlife-dependent priority public use with minimal adverse 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 fishing, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Fishing would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species known to occur on the refuge. Therefore, no significant adverse effects from fishing are anticipated. Allowing this use supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013) and the refuge's purpose associated with allowing wildlife-oriented recreational opportunities. This activity would not materially interfere with or detract from the mission of the Service, because providing this wildlife-dependent recreational opportunity is a focus of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 15-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

——— 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123–130.

Burger, J., and M. Gochfeld. 1998. Effects of eco-tourists on bird behavior at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13–21.

Cline, R., N. Sexton, and S.C. Stewart. 2007. A human-dimensions review of human-wildlife disturbance: a literature review of impacts, frameworks, and management solutions. U.S.

Geological Survey, Open-File Report 2007-1111, 88 pp.

Ensor, K.L., D.D. Helwig, and L.C. Wemmer. 1992. The common loon in Minnesota: potential contaminant implications. *In:* L. Morse, S. Stockwell and M. Pokras, eds., Proceedings from the 1992 conference on the loon and its ecosystem: status, management, and environmental concerns, Bar Harbor, Maine.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kiraly, I. 2012. Characterizing fish assemblage structure in the Penobscot River prior to dam removal. MS Thesis, University of Maine. 83 pages.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31–39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454–1465.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Lewin, W.C., R. Arlinghaus, and T. Mehner. 2006. Documented and potential biological impacts of recreational fishing: insights for management and conservation. Reviews in Fisheries Science 14:305-367.

Miller, S.G., Knight R.L., and Miller C.K. 1998. Influence of Recreational Trails on Breeding Bird Communities. Ecological Applications 8:162-169.

Morton, J.M., A.C. Fowler, and R. L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Pokras, M.A., and R. Chafel. 1992. Lead toxicosis from ingested fishing sinkers in adult common loons (*Gavia immer*) in New England. Journal of Zoology and Wildlife Medicine 23(1):92-97.

Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89–99.

——— 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139–145.

Rupp, R.S. 1955. Studies of the eastern brook trout population and fishery in Sunkhaze Stream, Maine. Journal of Wildlife Management 19(3):336-345.

Smithwood, D.A., and J.F. McKeon. 1999. Sunkhaze Meadows National Wildlife Refuge fisheries management plan. U.S. Fish and Wildlife Service, Laconia, New Hampshire.

U.S. Fish and Wildlife Service (USFWS). 2011. 2011 National survey of fishing, hunting, and wildlife-associated recreation: national overview.

Ward, D. H., and R. A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

COMPATIBILITY DETERMINATION

USE: Hunting

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2."... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is public hunting of migratory game birds (e.g., waterfowl), big game, and upland game game. Hunting is a priority public use of the National Wildlife 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?
Sunkhaze Meadows National Wildlife Refuge (NWR, refuge) has been open to public hunting of big game, upland game, and migratory game birds, for all Service-owned lands within the refuge boundary, since 1990 (USFWS 1990b). Lands open to hunting include upland deciduous, coniferous, and mixed forests, as well as refuge wetlands and peatlands. These habitats support big game such as moose, deer, and black bear, as well as snowshoe hare, ruffed grouse, woodcock, and waterfowl, among others.

(c) When would the use be conducted?
Hunting would be conducted during State of Maine seasons for big game, upland game, and waterfowl hunting seasons, and would be in accordance with Federal and State regulations. In cooperation with the State, hunt season dates and bag limits may be adjusted in the future as needed to achieve balanced wildlife population levels and to limit conflicts with other user groups.

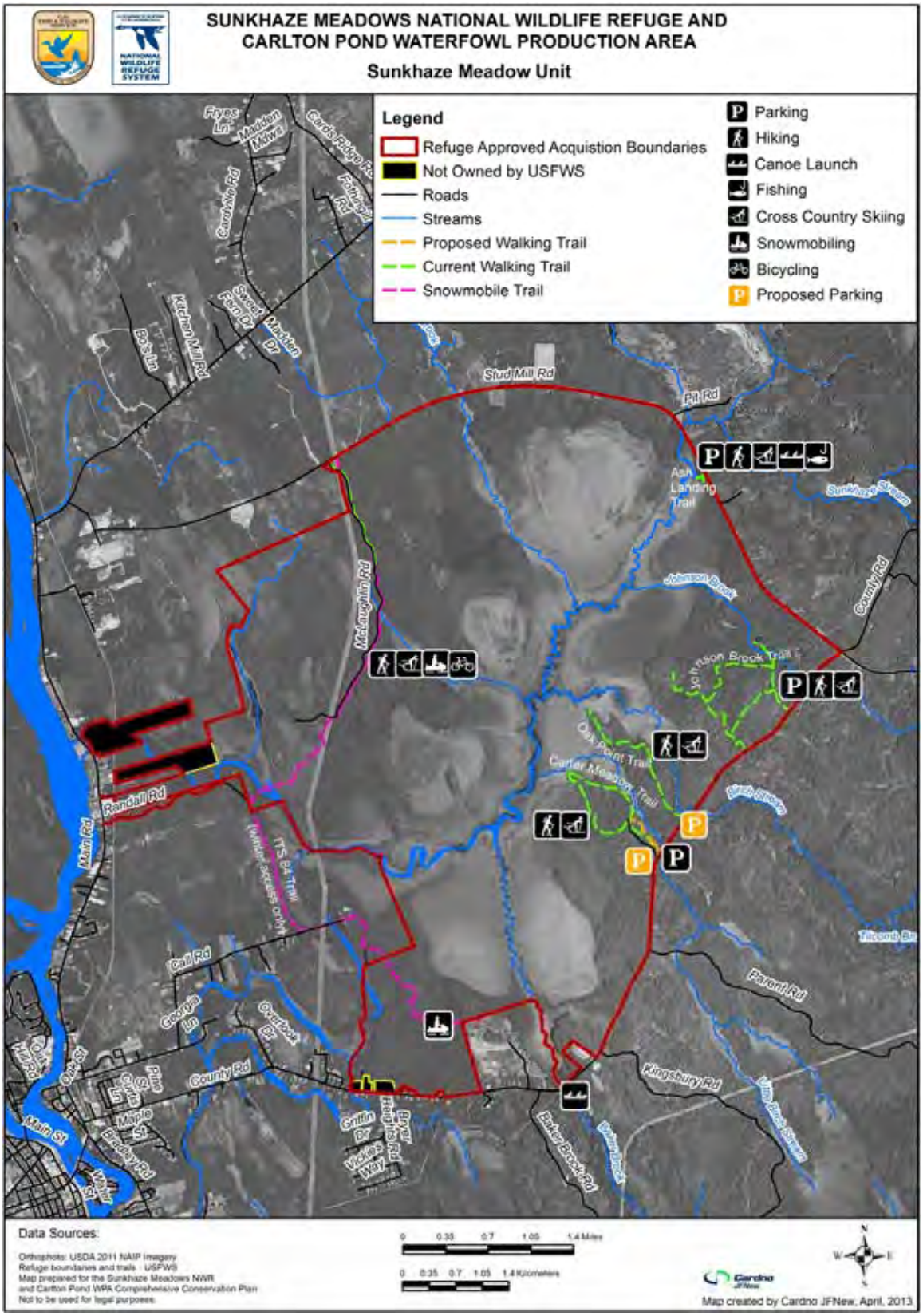
(d) How would the use be conducted?
The refuge permits hunting in accordance with State and Federal guidelines. Federal regulations contained in 50 CFR pertaining to the National Wildlife Refuge System Administration Act, as well as refuge-specific regulations, and stipulations in this compatibility determination would apply.

Hunters access the refuge on foot from the roadways, parking lots or trails, or via boats. In winter they may access the refuge via snowshoes or skis.

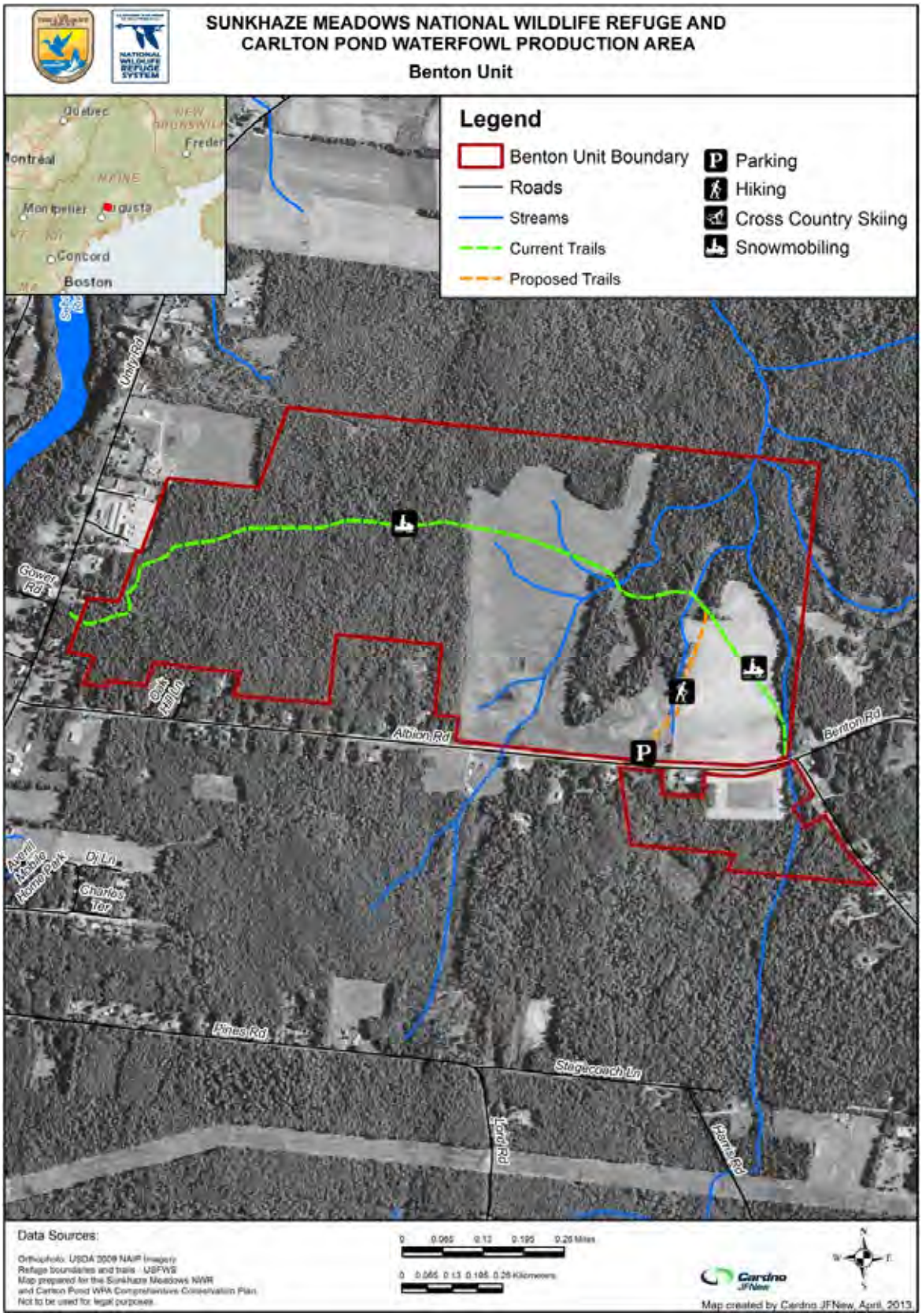
All areas of the refuge would continue to be open to the public for hunting season. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing). Signage at parking areas mentions that hunting is allowed and reminds visitors to wear blaze orange during appropriate time periods. Should visitor conflicts increase significantly, the refuge may consider zoning for different uses or area closures.

(e) Why is the 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 lands.

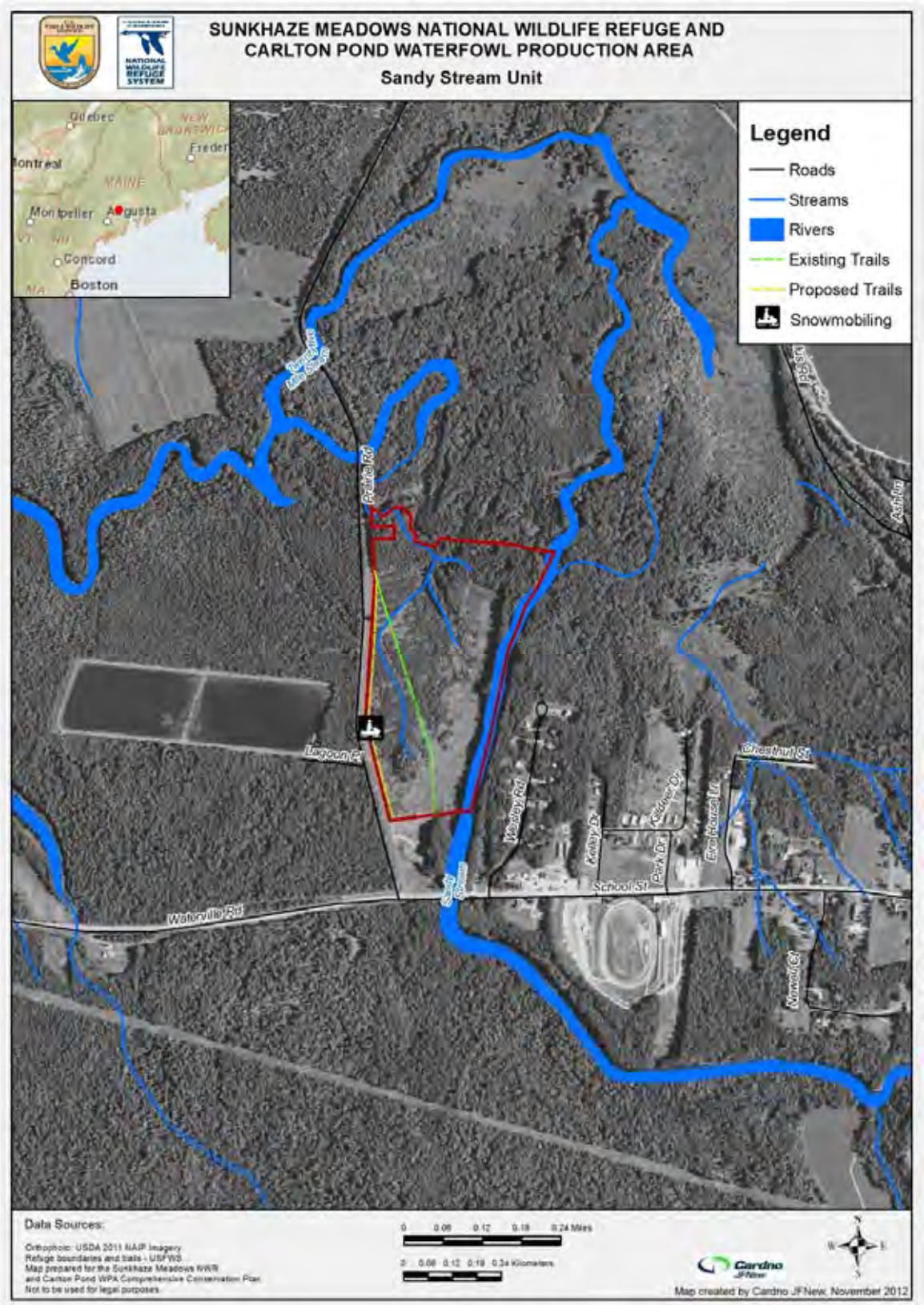
Map B.5. Hunting is allowed according to State and refuge regulations on all Service land within the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.6. Hunting is allowed according to State and refuge regulations on all land within the Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.7. Hunting is allowed according to State and refuge regulations on all land within the Sandy Stream Unit of Sunkhaze Meadows National Wildlife Refuge.



AVAILABLITY OF RESOURCES:

Additional fiscal resources to conduct this activity would be minimal as the refuge has been open to hunting since 1990 and since hunting would occur under State regulations and not as a refuge regulated hunting program. Costs associated with administration of this use include:

Preparation of Annual Hunt Plan:	$500	GS-11 Wildlife Biologist GS-12 Deputy Refuge Manager
Preparation and Updating of Refuge Hunting Brochure:	$300	GS-12 Deputy Refuge Manager GS-9 Refuge Officer
Dispensing Information during year:	$200	GS-6 Administrative Assistant
Law Enforcement/Outreach:	$3,000	GS-9 Refuge Officer
Total:	**$4,000**	

Based on a review of the budget allocated for hunting management, funding is adequate to ensure compatibility, and administer and manage the recreational use listed. Sufficient resources are available to continue the existing hunting program. Our existing staff and budget provide sufficient resources to continue current management.

ANTICIPATED IMPACTS OF THE USE:

Effects on Wildlife – Game Species

Waterfowl

Adverse effects on waterfowl populations are not expected because of the hunting regulations and bag limits that have been set in place by the Federal and State agencies (USFWS Migratory Bird Office and the Maine Department of Inland Fisheries and Wildlife (MDIFW)) that manage the harvest of waterfowl populations. Significant conservation measures and extensive pre- and post-season population monitoring and the institution of Adaptive Harvest Management are safeguards inherent in waterfowl management. Adverse effects on other game species are not expected, because hunting would occur under State and Federal regulations. The MDIFW and the Service set harvest limits that take into account game species population data collected by State biologists and wildlife species assessments.

Woodcock

Restrictive hunting regulations have been in effect for American woodcock since 1985 when surveys indicated a decline in numbers since the 1960s. The Service and State agencies monitor the population closely through a Migratory Bird Harvest Information Program (HIP) and also spring singing male counts (SGS) throughout the birds range.

Based on data from the HIP, 7,100 woodcock hunters harvested 31,700 woodcock in Maine last year. The long-term trend (1968 to 2011) indicates a decline in woodcock numbers across their range; however, 2011 was the eighth year in a row that the population appears stable. In 2011, the number of males heard on SGS routes (3.58) was slightly higher than 2010 (3.41) and was above the 10-year average of 3.42 (MDIFW 2011a).

Effects on Wildlife - Resident Game Species

The MDIFW is responsible for the management of resident wildlife including game mammal species. They use a variety of methods to assess population levels and develop harvest strategies. While individual mammals are harvested as part of the refuge's hunt program, because of the State's efforts to monitor and regulate harvest of resident mammal species, we do not expect adverse impacts at the population level from harvesting these species. Additional information on harvests and State efforts to manage resident game species follows.

White-tailed Deer

During 2011, 198,107 deer hunting licenses were sold in Maine with hunter densities averaging about seven per square mile. Statewide, these hunters spent an estimated 1.08 million hunter days pursuing deer during Maine's 79-day deer hunting season. Deer hunting success was estimated at 11 percent in 2011 with 18,784 deer harvested. Wildlife Management District (WMD) 18, which includes the Sunkhaze Meadows Unit, had 258 deer harvested. WMD 23, which includes the Benton and Sandy Stream Units, had 1,657 deer harvested.

Deer populations vary considerably from region to region in the State largely due to severity of winter conditions with highest densities found in southern Maine and lowest numbers found to the north. MDIFW allocates a specific number of permits and take methods across 29 individual Wildlife Management Districts based on previous harvest data, and deer abundance aerial surveys to ensure healthy populations of deer within the State.

Moose

The annual allocation of moose permits is a function of specific management goals for each WMD. Permits were awarded to applicants by a computerized lottery with 49,889 applying for 3,903 permits. In 2011, 2,582 moose were checked into hunt stations. Of those, 38 moose were harvested in the WMD which includes the Sunkhaze Meadows Unit and 2 moose were harvested in the WMD which includes the Benton and Sandy Stream Units. Statewide, the success rate for last year's hunt was 79 percent which is equal to the average success rate for the last 9 years.

Aerial surveys are conducted in nine WMDs to count the number of bulls, cows, and calves. Based on these surveys, MDIFW estimated the 2011 Statewide moose population to be 76,000. These surveys, combined with data collected on female moose reproduction, survival rates obtained by aging teeth, and hunter sight-rate data, allows MDIFW to ensure that the harvest is in keeping with a healthy moose population.

Black Bear

The forests of Maine support the largest black bear population in the Eastern United States. For more than 35 years, MDIFW has closely monitored bears to ensure their management decisions are based on current and sound information. Harvest levels are determined based on harvest data and samples of teeth collected which help to show population trends and the number of bears present in the population.

The State regulates harvest by setting season length, bag limit, and legal methods of hunting. Most bears are harvested by hunting over bait (75 percent), 12 percent using dogs, 6 percent by

deer hunters, 4 percent by still hunting[1], and 3 percent in traps. The total harvest in 2011 was 2,400 with 137 taken in the WMD that includes the Sunkhaze Meadows Unit. Eight bears were harvested in WMD 23 which includes Benton and Sandy Stream Units. No baiting is allowed on the refuge, and the refuge hunt season would be shorter than the State season (which starts August 26, 2013), which reduces harvest compared to surrounding areas.

Furbearers and Small Mammals

In Maine, many mammals are harvested for their pelt value. Many of the species are harvested by trapping but the following are also hunted: coyote, bobcat, raccoon, skunk, snowshoe hare, gray squirrel, woodchuck, porcupine, and red squirrel.

Currently the State's coyote population is between 10,000 to 12,000 in the winter and increases to 19,000 in spring. This number decreases due to the low number of pups that survive after birth. The coyote population would likely remain relatively constant unless wolves reestablish themselves in the State and then it is believed the coyote population would drastically decline (Jakubas 1999). The coyote population in Maine has been the center of controversy in recent years because of its potential role in affecting deer populations. There is a desire by some public to control or eliminate coyote populations. However, hunting and trapping has been shown to have little effect in determining Statewide population levels. There would need to be mortality rates greater than 70 percent for there to be a reduction in the population (Jakubas 1999). In 2011, 1,623 coyotes were taken in Maine through hunting and trapping.

The red fox population is distributed Statewide (Caron 1986) and is currently considered to be abundant and stable (Jakubas 2004). Red fox are hunted but most of the take for this species is through trapping. Harvests across the State in 2011 through trapping and hunting totaled 922.

The bobcat is a trapped and hunted species that is distributed over most of the State (Morris 1986). The Bobcat Management System is used to manage bobcat populations in the State (McLaughlin 1995). The number of bobcat harvested in 2011 through trapping and hunting was 305.

Population trends for the stripped skunk, porcupine, and woodchuck are unknown according to the State of Maine since harvests are not recorded.

Human Disturbance Effects

Hunting can have direct and indirect impacts on both target and non-target species. These impacts include direct mortality of individuals; changes in wildlife behavior; changes in wildlife population structure, dynamics, and distribution patterns; and disturbance from noise and hunters walking on- and off-trail (Cole and Knight 1990, Cole 1995, Bell and Austin 1985). In many cases, hunting removes a portion of the wildlife population that would otherwise naturally succumb to predation, disease, or competition (Bartmann et al. 1992). Typical changes in deer behavior in response to hunting include avoidance of certain areas, becoming more wary, staying closer to cover, and shifting feeding times (e.g., feeding more at night) (King and Workman 1986). For waterfowl species, hunting may also make them more skittish and prone to

[1] Rather than being completely 'still,' still hunters move slowly, deliberately, and quietly through the habitat looking for tracks, movement, fur, or other signs of the animal.

disturbance, reduce the amount of time they spend foraging and resting, alter their habitat usage patterns, and disrupt their pair and family bonds (Raveling 1979, Owen 1977, White-Robinson 1982, Madsen 1985, Bartelt 1987).

In general, visitors to the refuge engaged in hunting would be walking off-trail in designated areas open to hunting. General disturbance from recreational activities, including hunting, vary with the wildlife species involved and the activity's type, level, frequency, duration, and the time of year it occurs. The responses of wildlife to human activities, such as hunting, include avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Kahl 1991, Klein 1993, Whittaker and Knight 1998), the use of suboptimal 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, Whittaker and Knight 1998), attraction (Whittaker and Knight1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). The amount of disturbance tends to increase with decreased distance between visitors and birds (Burger 1986).

Some bird species flee from human disturbance, which can lower their nesting productivity and cause disease and death (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. Bird communities in this study were apparently affected by the presence of recreational trails, where common species (i.e., American robins) were found near trails and more specialized species (i.e., grasshopper sparrows) were found farther from trails. Nest predation also was found to be greater near trails (Miller et al. 1998). 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, makes males rely more heavily on physical deterrents in defending territories, which are time and energy consuming (Ewald and Carpenter 1978).

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) note that females with young (such as white-tailed deer) are more likely to flee from a disturbance than those without young.

The hunt at the refuge has been conducted since 1990 with no significant disturbance noted due to this use. Although the refuge has been unstaffed since 2008, weekly law enforcement patrols have been occurring since 2010. Since no permit system is in place, exact numbers of hunters using the refuge are not known. A number of hunters participate in the hunt, but they are dispersed over such a large area that disturbance in any one place has not been significant. With the exception of bald eagles, hunting takes place outside of the nesting period for migratory birds, further minimizing the potential effects on these species. Disturbance to bald eagles associated with this activity is expected to be minimal because 1) the overlap between hunting seasons and bald eagle nesting is limited (about 1 to 2 months), and 2) this is an existing use of the refuge and adverse impacts to this species have not been observed to date.

Effects on Vegetation
The physical effects on vegetation from hunting various game species on the refuge are expected to be minimal. All-terrain vehicles would not be allowed on the refuge. Other vehicles are restricted to designated roadways. Hunter use is generally dispersed over large areas. Hunters would have little to no impact on the vegetation.

Positive, indirect effects on the vegetation would result from a reduction in the white-tailed deer population. 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). 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 would be positive and result in better regeneration of forest canopy species and an increase in the diversity of the herbaceous understory. In summary, there would be few if any negative impacts from this use on the refuge's vegetation, but there would be beneficial impacts from the decrease of deer browse on the refuge's vegetation due to the decrease in the number of deer on refuge lands.

Possible negative cumulative impacts of the proposed activity include temporary trampling of vegetation and light soil erosion. Most hunting occurs during the fall and winter when the ground is either frozen, covered in snow, or when plants are dormant. For these reasons, cumulative impacts to plant communities and soils are not likely to be significant.

Effects on Soils
It is anticipated that minor impacts to soils would occur as a result of allowing hunting access on the refuge. Erosion potential would 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 current use level, impacts to soils (erosion, compaction) are not likely to be significant.

Effects on Air Quality
Air quality and water quality impacts would be minimal and only due to refuge visitors' automobile emissions and run-off on roads and trails. These effects would not only come from hunters but from a majority of users of wildlife-dependent recreation on the refuge. Given the traditional low number of hunters, the effects on overall air and water quality in the region would be negligible, compared to the effects from non-refuge sources.

Economic Effects
The 2011 national survey of fishing, hunting, and wildlife-associated recreation reveals that 1,117,000 Maine residents and nonresidents 16 years old and older fished, hunted, or watched wildlife in Maine. Of that total, 341,000 fished, 181,000 hunted, and 838,000 participated in wildlife watching activities, including observing, feeding, and photographing wildlife (USFWS 2011). While we do not have exact numbers of hunters on the refuge units, visitors participating in this use provided some economic benefit to the local economies by purchasing goods and services (e.g., food, lodging, gas) in and around the three refuge units.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The hunt program would be managed in accordance with Federal and State regulations. The program would be reviewed annually to ensure that wildlife and habitat management goals are achieved and that the program is providing a safe, high quality hunting experience for participants. Stipulations are based on the refuge's Final Amended Environmental Assessment: Public Hunting (USFWS 1990a) and Hunting Management Plan (USFWS 1990b).

Refuge-specific regulations would further minimize negative impacts of the hunt on refuge habitat and wildlife. Compliance with regulations would be achieved through education, signage, and law enforcement. Refuge-specific regulations for 2012 are listed below (see also 50 CFR 32.38):

- *Migratory Game Bird Hunting*. We allow hunting of migratory game birds on all areas of the refuge in accordance with State regulations.

- *Upland Game Hunting*. We allow hunting of upland game on all areas of the refuge in accordance with State regulations subject to the following conditions:

    1. Shotgun hunters may possess only approved nontoxic shot while in the field (see 50 CFR 32.2(k)).

    2. We allow eastern coyote hunting from October 1 to March 31.

    3. We allow hunters to enter the refuge 1 hour before legal shooting hours (0.5 hours before legal sunrise in the State of Maine), and they must exit the refuge by 1 hour past legal shooting hours (0.5 hours after legal sunset in the State of Maine), except for hunters pursuing raccoons and coyotes at night.

    4. The hunter must retrieve all species, including coyotes, harvested on the refuge.

- *Big Game Hunting.* We allow hunting of black bear, bobcat, moose, and white-tailed deer on all areas of the refuge in accordance with State regulations subject to the following conditions:

    1. We require hunter-orange clothing in accordance with State of Maine regulations.

    2. We allow hunters to enter the refuge 1 hour before legal shooting hours (0.5 hours before legal sunrise in the State of Maine), and they must exit the refuge by 1 hour past legal shooting hours (0.5 hours after legal sunset in the State of Maine).

    3. We allow bear hunting from October 1 to the end of the State-prescribed season. We prohibit the use of bait during the hunting of bears.

    4. All tree stands must be removed by the last day of the white-tailed deer hunting season (see 50 CFR 27.93).

JUSTIFICATION:

Hunting is a priority public use of the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife resources (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997). The Service's policy is to provide enhanced opportunities for this use when compatible and consistent with sound fish and wildlife management. In addition, hunting is an historic use of the refuge and is a popular, traditional recreation activity on public lands in Maine that is strongly supported by the Maine Department of Inland Fisheries and Wildlife.

Allowing hunting on Sunkhaze Meadows NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, hunting is a wildlife-dependent priority public use with minimal adverse 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 hunting, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Hunting would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species that occur on the refuge. Therefore, no significant adverse effects from public hunting are anticipated. Allowing this use supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013) and the refuge's purpose associated with allowing wildlife-oriented recreational opportunities. This activity would not materially interfere with or detract from the mission of the Service, because providing this wildlife-dependent recreational opportunity is a focus of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 15-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male Song Sparrows. Animal Behavior 35:773-784.

Bartelt, G.A. 1987. Effects of disturbance and hunting on the behavior of Canada geese family groups in East Central Wisconsin. Journal of Wildlife Management 51:517-522.

Bartmann, R.M., G.C. White, and L.H. Carpenter. 1992. Compensatory mortality in a Colorado mule deer population. Wildlife Monographs 121.

Behrend, D.F., G.F. Mattfield, W.C. Tierson and J.E. Wiley. 1970. Deer density control for comprehensive forest management. Journal of Forestry 68:695-700.

Belanger, L. and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Bell, D.V. and L.W. Austin. 1985. The game-fishing season and its effects on overwintering wildfowl. Biological Conservation 33:65-80.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

Caron, M. 1986. Red fox assessment – 1985. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 34 pp.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. Pages 425–466, *in:* Hendee, J.C., G.H. Stankey, R.C. Lucas, eds., Wilderness Management. North American Press, Golden, Colorado.

Cole, D.N. and R.L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. Natural Resources and Environmental Issues 0:33-40.

Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two Mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation. 18:39-51.

Ewald P.W. and F.L. Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31: 277-292.

Hammitt, W.E. and D.N. Cole. 1998. Wildlife Recreation: Ecology and Management (2nd edition). New York: John Wiley & Sons. 361pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Jakubas, W.J. 1999. Coyote assessment – 1999. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 67 pp.

——— 2004. Furbearers and small game mammals. Pages 20-22 *in:* Wildlife Division Research and Management Report 2004. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 78 pp.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Kaiser, M.S. and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

King, M.M. and G.W. Workman. 1986. Response of desert bighorn sheep to human harassment: management implications. Transactions 51st North American Wildlife and Natural Resource Conference.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31–39.

Knight, R.L. and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pages 249-297, *in:* A. Sprunt IV, J.C. Ogden, and S. Winckler, eds., Wading Birds, Res. Rep. 7. National Audubon Society, New York.

Madsen, J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. Biological Conservation 33:53-63.

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2011a. Research and Management Report. State of Maine.

——— 2011b. Migratory Game Bird Hunting Schedule. State of Maine.

——— 2011c. Hunting and Trapping Laws and Rules. State of Maine.

McLaughlin, C.R. 1995. Bobcat management system. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 21 pp. plus appendixes.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of Recreational Trails on Breeding Bird Communities. Ecological Applications 8:162-169.

Morris, K.I. 1986. Bobcat Assessment 1986. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 43 pp.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410.

Office of the Federal Register National Archives and Records Administration. 2011. Wildlife and Fisheries. Code of Federal Regulations. U.S. Government Printing Office, Washington, DC.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Raveling, D.G. 1979. Traditional use of migration and winter roost sites by Canada geese. Journal of Wildlife Management. 43:229-235.

Tierson, W.C., E.F. Patric and D.F. Behrend. 1966. Influence of white-tailed deer on the logged northern hardwood forest. J. Forestry. 64:804-805.

Tilghman, N.G. 1989. Impacts of white-tailed deer on forest regeneration in northwestern Pennsylvania. Journal of Wildlife Management 53:524-532.

U.S. Fish and Wildlife Service (USFWS). 1990a. Final environmental assessment: Public hunting at Sunkhaze Meadows National Wildlife Refuge, Maine.

——— 1990b. Hunting management plan for Sunkhaze National Wildlife Refuge.

——— 1997. National Wildlife Refuge Improvement Act 1997. Public Law 105-57-Oct. 9, 1997.

——— 2011. 2011 National survey of fishing, hunting, and wildlife-associated recreation: national overview.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

Ward, D.H. and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

White-Robinson, R. 1982. Inland and saltmarsh feeding of wintering brent geese in Essex. Wildfowl 33:113-118.

Whittaker, D. and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J. and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

COMPATIBILITY DETERMINATION

USE: Furbearer Management (trapping)

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)), "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

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 an allowable practice in Maine and would be conducted in locations where it will accomplish refuge goals and objectives. Currently, trapping is allowed at the Sunkhaze Meadows Unit and the Benton Unit, but not at the Sandy Stream Unit. Traps may be set anywhere within these two units, except that no traps are to be set where they can be easily seen from visitor vantage points, nor within 100 feet of roads or trails (see Stipulations section below).

Sunkhaze Meadows National Wildlife Refuge (NWR, refuge) has had fairly light demand for trapping. Analyzing the averages since 2001, trappers have requested an average of 8.4 permits per year, but only six trappers per year have actually trapped. Therefore, zones have not been established nor limits set. However, if necessary, such controls could be implemented to meet our goals for protecting refuge resources.

Refuge law enforcement would ensure that trappers on the refuge comply with State and refuge regulations and that the data submitted to the refuge are accurate.

(c) When would the use be conducted?
Furbearer management would be conducted in accordance with the Maine State seasons. Maine furbearer management seasons usually run from mid-October to the end of December, with beaver trapping in Wildlife Management District 18, where the Sunkhaze Meadows Unit is located, allowed until mid-April.

(d) How would the use be conducted?
The refuge would be open to furbearer management for the following species: beaver, bobcat, mink, fisher, marten, coyote, fox, muskrat, opossum, otter, raccoon, red squirrel, skunk, and weasel. Although bear trapping is allowed in Maine, bears are not considered a furbearer. Bear trapping is not allowed on the refuge. Data collected over the 9 years from 2001 through 2010 shows that trappers at the Sunkhaze Meadows Unit are overwhelmingly targeting beaver and muskrat. Trapper reports show that total take has been an average of 15 beavers per year and 11 muskrats per year during that time period. Other than these rodents, which have a high reproductive capacity, only one bobcat, one coyote, three fisher, four mink, six otters, one raccoon, and two skunks have been taken in that time.

As specified in the Furbearer Management Plan, we would conduct furbearer management activities following Maine State regulations and impose any necessary refuge-specific restrictions through issuance of a special use permit (SUP). The refuge would allow furbearer management during State seasons under State limits for the targeted species. The 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 CFR 29.1). Trappers are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

We would continue to manage the furbearer management program through the SUP process and, if needed, would work with the State to have special furbearer management regulations. Administering the program under an annual SUP would allow the refuge manager to have a ready list of contacts for requests for specific management needs to accomplish refuge objectives.

We would require a harvest report from each trapper following the close of the trapping season. The report would include data about the trapping effort (trap-days), the time span of trapping by species, the number of target and non-target species harvested, the refuge areas trapped, and

remarks on observations of wildlife or other noteworthy ecological information. Those data would provide a basis for catch-per-unit effort and population trend analyses. We would continue to use these data to monitor potential impacts of this use on refuge populations of furbearers, as well as the overall status of refuge furbearer populations. If the required information is lacking for a trapper from the previous year, we would not issue the SUP for the next year.

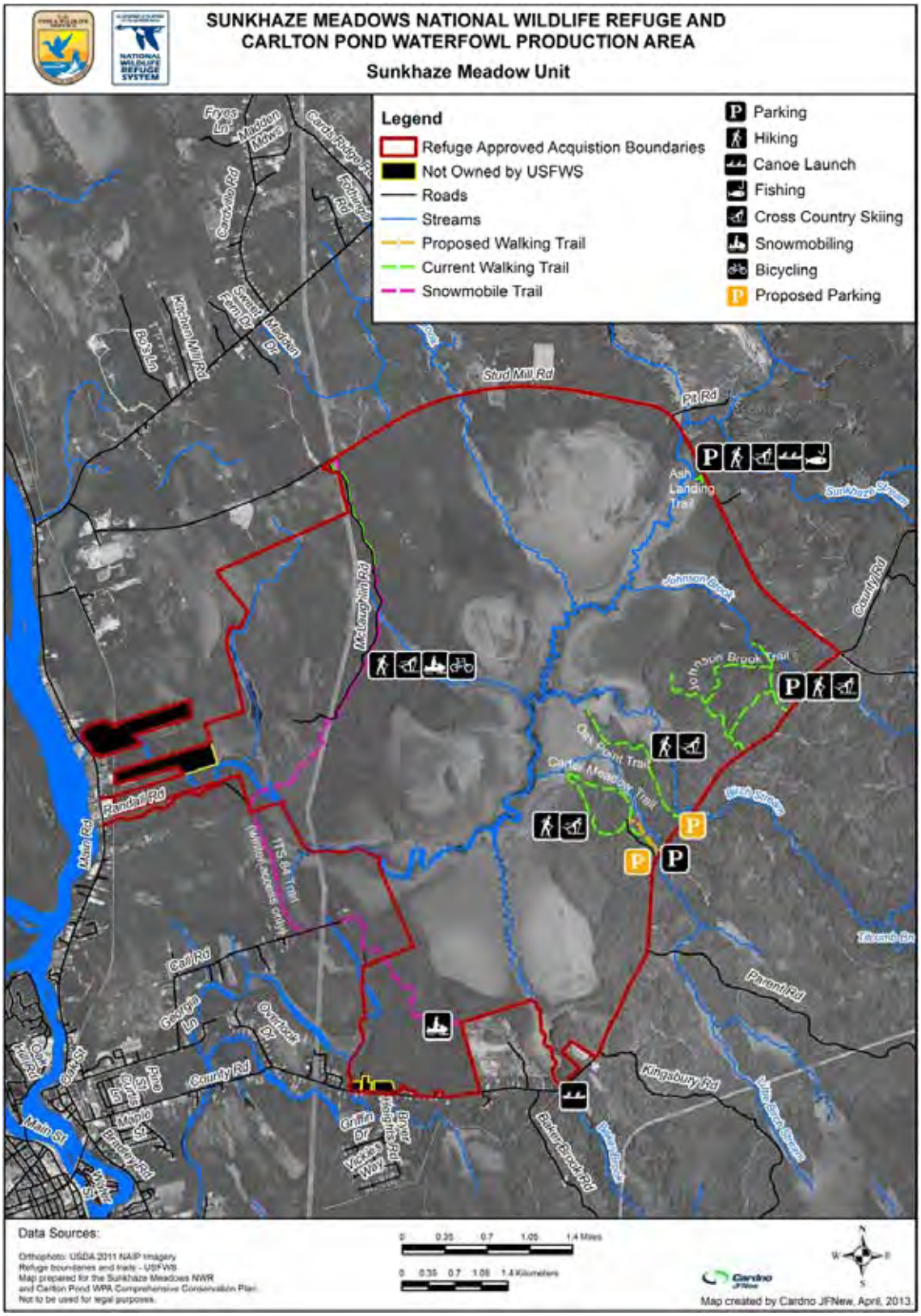
(e) Why is this use being proposed?
Because trapping is considered an economic use, per Federal law (see 16 U.S.C. 715(s)) and Service regulations (50 CFR 29.1), we may only allow economic uses of a refuge or WPA natural resource where the use contributes to achieving refuge or WPA purposes or the Refuge System mission. We would conduct furbearer management: (1) as a tool to manage habitat and maintain the predator-to-prey balance, (2) as a mechanism to collect survey and monitoring information that otherwise would be expensive and difficult to obtain using refuge resources, and (3) as a way to collect initial data 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, environmental education, a greater understanding of ecological relationships, stewardship of natural resources, and inter-generational passage 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).

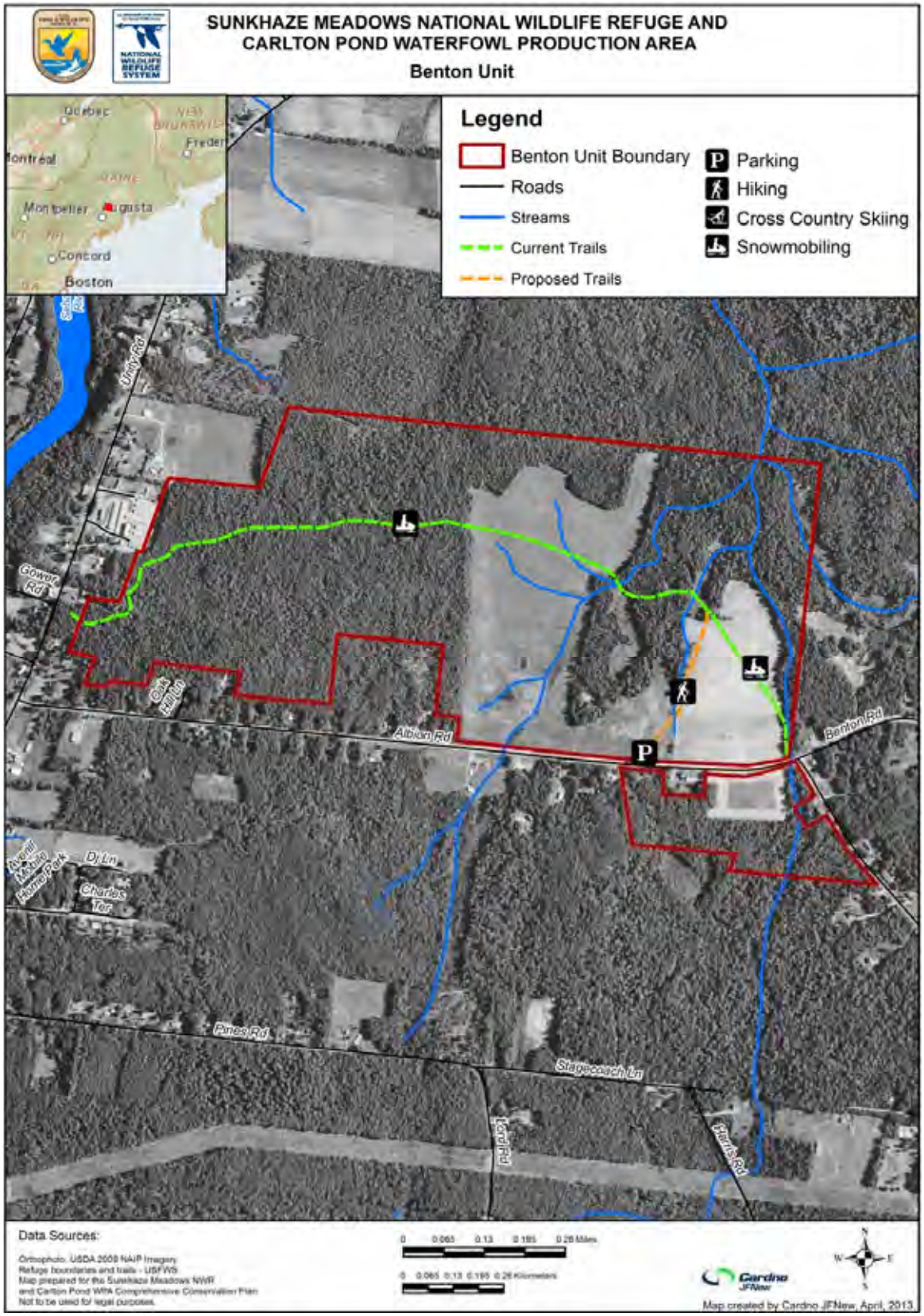
AVAILABLITY OF RESOURCES:

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 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 and compile trapping reports. An administrative assistant would be required to help process SUPs. The refuge’s law enforcement officer, in coordination with other law enforcement agencies, would check refuge trappers and ensure compliance with State and refuge regulations.

Map B.8. Trapping is allowed according to State and refuge regulations within the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.9. Trapping is allowed according to State and refuge regulations within the Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



A breakdown of the projected annual cost of the trapping programs is shown below:

Administration:	$60
Law Enforcement and Monitoring:	$800
Biological Staff Time (Program Oversight):	$500
Total:	**$1,360**

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. We have incorporated impacts of trappers using snowshoes or skis to access traps under "Anticipated Impacts of the Use" in the compatibility determination for snowshoeing and cross-country skiing.

Direct effects of trapping include the removal of individuals of both target (i.e. furbearer) and 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 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 to wildlife and humans.

Maine Department of Inland Fisheries and Wildlife considers most furbearer populations around the Sunkhaze Meadows Unit to be stable (J. DePue, MDIFW 2013 personal communication). There is some concern about recent declines in fisher and bobcat harvests in this area; there is also concern about over harvest of river otters in this area (J. DePue, MDIFW 2013 personal communication). As noted above, trapper reports show that an average of 15 beavers and 11 muskrats have been taken per year between 2001 and 2010. Other than these species, which have a high reproductive capacity, only one bobcat, one coyote, three fisher, four mink, six otters, one raccoon, and two skunks have been taken between 2001 and 2010. Because most furbearer populations are considered to be stable in the area and because of the low harvest levels of other species (i.e., bobcat, fisher, and otter), we do not expect the refuge's trapping program to have adverse effects on furbearers at the population level.

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 the welfare of animals in trapping 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 Other Wildlife:
Non-target species could be taken incidentally through this trapping program. Traps will be set specifically around areas of targeted species activity to reduce the risk of taking species other than targeted species. The experience of the trappers and the selection of the appropriate trap size will reduce non-target captures (Northeast Furbearer Resources Technical Committee 1996, Boggess et al. 1990). State regulations require that bait be covered, so birds of prey are not able to see the bait from above. Lynx (federally listed as endangered) have not been documented on the refuge. Therefore, potential impacts to lynx are negligible or nonexistent. If lynx are someday identified on the refuge, the refuge manager will work with the State of Maine to implement measures to prevent accidental take of lynx. The refuge manager will ensure that measures are utilized to avoid take of waterfowl and other non-target species.

Trappers may temporarily disturb wildlife while walking around the refuge. 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 and breeding wildlife using the refuge, disturbance of migratory birds by trappers would be negligible, and can be further reduced by regulating trapping activity in certain areas at times when such birds are likely to be present.

Conflicts with Other Public Uses:
A program of regulated furbearer management on the refuge as described under this compatibility determination is not expected to conflict with public use on the refuge. 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. Stipulations set forth in this CD also require that traps would continue to be set only where traps or trapped furbearers are not readily visible from public highways, overlooks, or other visitor facilities. No land sets may be set within 100 feet of any road or trail open to the public. These characteristics serve to limit the potential for encounters between traps or captured animals and those engaged in other public use activities.

In addition**,** Maine furbearer management seasons usually run from mid-October to the end of December, with beaver trapping in Wildlife Management District 18, where the Sunkhaze Meadows Unit is located, allowed until mid-April. Trappers usually rely on thick ice to get out to where they set their beaver and muskrat traps, and although other visitors snowshoe and ski in the winter, these visitors are not as likely to ski or snowshoe in this very coldest weather, nor are they as likely to go all the way out to the streams.

Other Beneficial Impacts:
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, and the conservation and enhancement of biological and genetic diversity (Boggess et al. 1990, Organ et al. 1996).

Implementation of a regulated trapping program on the refuge provides a mechanism to collect survey and monitoring 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 even 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.

Furbearers are considered a renewable natural resource with cultural and economic values (Andelt et al. 1999, Boggess et al. 1990, Northeast Furbearer Resources Technical Committee 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 refuge also fosters the appreciation of wildlife and nature, wildlife observation, environmental education, a greater understanding of ecological relationships, stewardship of natural resources, and inter-generational passage of the methodologies of renewable resource use. Trapping is an activity in which family members and friends often participate together and share joint 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 comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Permittees must comply with all conditions of the refuge furbearer management SUP and all State regulations relating to trapping .

- Traps shall be set only where traps or trapped furbearers are not readily visible from public highways, overlooks, or other visitor facilities. No land sets may be set within 100 feet of any road or trail open to the public.

- Permittees, when requested by refuge staff or Federal or State enforcement officers, must display for inspection their State trapping license, refuge trapping permit, trapping equipment, and all animals in their possession.

- Ingress to and egress from the refuge shall be only by routes that are currently open for travel. Motorized vehicles are restricted to McLaughlin Road when the gate is open during hunting season, and travel by snowmobile only allowed on ITS 84. Use of all-terrain vehicles is prohibited anywhere on the refuge. Permittees will use good judgement to avoid damage to refuge roads, lands, and waters, and will promptly report any such damage caused or observed. Permittees must not interfere with or cause hazards to vehicular or snowmobile travel, or the activities of other refuge visitors.

- Permittees shall, no later than 30 days after the last day of the refuge trapping season, submit to the refuge manager the trapping report form provided with the trapper permit, even if no trapping was conducted or no animals taken.

- Use of all-terrain vehicles is prohibited anywhere on the refuge. Trappers must not interfere with or cause hazards to vehicular travel, or the activities of other refuge visitors.

- The use of exposed bait and setting traps adjacent to naturally occuring carcasses are prohibited.

- Permittees will be issued the booklet "How to Avoid Incidental Take of Lynx." Any lynx capture will be handled according to established refuge protocol for reporting, investigating, and releasing a lynx which is incidentally caught. That will include the immediate notification of and cooperation with the Service, Maine Department of Inland Fisheries and Wildlife, and the Maine Warden Service.

- Permittees must immediately release non-target species (other than lynx) that are uninjured and report those captures by species and number as part of the annual report. Injured or killed animals must be reported as specified by the Maine Department of Inland Fisheries and Wildlife trapping regulations and also mentioned in the annual report to the refuge.

JUSTIFICATION:

We have determined that allowing trapping on the refuge would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System or the purposes for which the refuge was established for the following reasons. First, furbearer populations, with local exceptions, are stable or increasing in Maine and the furbearer management program on the refuge does not have any known negative impacts on furbearer populations. Second, at current and projected levels of 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) using the refuge.

In fact, based on the analysis presented above, we have determined that it would contribute to the mission of the National Wildlife Refuge System and the purposes for which the refuge was established. Furbearer management through trapping on the refuge is a useful tool in maintaining balance between furbearers and habitat. High populations of predators can decrease the survival and nesting success of migratory birds, thus compromising the central purpose of the refuge. Trapping may provide survey and 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. Trappers who participate could 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; maintenance of the vigor and health of furbearer populations; and safeguarding the refuge infrastructure critical to habitat management for focal fish and wildlife species. Trapping also helps build appreciation for natural resources, ecological awareness, and support for the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Andelt, W.F., R.L. Phillips, R.H. Schmidt, and R.B. Gill. 1999. Trapping furbearers: an overview of the biological and social issues surrounding a public controversy. Wildlife Society Bulletin 27(1):53-64.

Boggess, E.K., G.R. Batcheller, R.G. Linscombe, J.W. Greer, M. Novak, S.B. Linhart, D.W. Erickson, A.W. Todd, D.C. Juve, and D.A. Wade. 1990. Traps, trapping, and furbearer management. Wildlife Society Technical Review 90-1, The Wildlife Society, Bethesda, Maryland.

Daigle, J.J., R.M. Muth, R.R. Zwick, and R.J. Glass. 1998. Sociocultural dimensions of trapping: a factor analytical study of trappers in six northeastern states. Wildlife Society Bulletin 26:614-625.

DePue, John 2013. Furbearer and Small Mammal Biologist, Maine Department of Inland Fisheries and Wildlife, personal communication.

Gentile, J.R. 1987. The evolution of anti-trapping sentiment in the United States: A review and commentary. Wildlife Society Bulletin 15:490-503.

Gill, J.A., W.J. Sutherland, and A.R. Watkinson. 1996. A method to quantify the effects of human disturbance on animal populations. Journal of Applied Ecology 33:786-792.

Glass, R.J., T.A. More, and J.J. DiStefano. 1991. Vermont trappers: characteristics, motivations, and attitudes. Transactions of the Northeast Section of The Wildlife Society 48:134-143.

International Association of Fish and Wildlife Agencies (IAFWA). 1998. Best Management Practices for trapping furbearers in the United States. International Association of Fish and Wildlife Agencies, Washington, DC.

Jensen, P.G., P.D. Curtis, and D.L. Hamelin. 1999. Managing nuisance beavers along roadsides, a guide for highway departments. Federal Aid in Wildlife Restoration Program Number

WE-173-G, New York State Department of Environmental Conservation and Cornell Cooperative Extension Service, Cornell University, Ithaca, New York.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp.238-247.

Kuss, F.R., and C.N. Hall. 1991. Ground flora trampling studies: Five years after closure. Environmental Management 15(5):715-727.

Maryland Department of Natural Resources. Furbearer management in Maryland, management tools and their application. 2000. Special Report, Maryland Department of Natural Resources. Annapolis, Maryland.

Mason, D.A. 1990. Vermont's other economy: the economic and socio-cultural values of hunting, fishing, and trapping for rural households. Thesis, University of Vermont, Burlington.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

National Wildlife Federation. 1979. Trapping and conservation. National Wildlife Federation. Washington, DC.

Northeast Furbearer Resources Technical Committee. 1996. Trapping and furbearer management: perspectives from the Northeast. 33pp.

Payne, N.F. 1980. Furbearer management and trapping. Wildlife Society Bulletin 8:345-348.

Schultz, R.D., and M. Stock. 1993. Kentish plovers and tourist-competitors on sandy coasts? Wader Study Group Bulletin 68(special issue): 83-92.

Southwick Associates. 1999. Bears in the backyard, deer in the driveway: The importance of hunting and trapping in helping wildlife professional manage our treasured wildlife resources. International Association of Fish and Wildlife Agencies, Washington, DC.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge
Use: Ice Skating

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(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?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

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 X 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 X **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: Sunkhaze Meadows National Wildlife Refuge

Use: Ice skating

Narrative

Ice skating 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).

Occasionally, conditions are such that ice skating on Sunkhaze Stream is tempting. Refuge staff have received reports that some people have participated in this use on the refuge in the past. Ice skating is generally safe on ponds and lakes in Maine when the winter is cold and the ice is think enough. However, ice thicknesses over moving water are sometimes not uniform. Based on our evaluation, we have found ice skating not appropriate at Sunkhaze Meadows National Wildlife Refuge because it is not consistent with public safety. There is the potential for ice skaters to fall through areas of thin ice and become injured.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Recreational gathering of blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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**_X_

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: Sunkhaze Meadows National Wildlife Refuge

Use: Recreational gathering of blueberries, blackberries, strawberries, raspberries, cranberries, 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, cranberries, 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.

The gathering of berries, mushrooms, fiddleheads, and antler sheds are historic uses of Sunkhaze Meadows National 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 environmental assessment prepared for the refuge's establishment (see page 35 in USFWS 1988), and 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). 1988. Final environmental assessment: proposal to establish Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 5. Newton Corner, Massachusetts.

COMPATIBILITY DETERMINATION

USE: Recreational Gathering of Blueberries, Blackberries, Strawberries, Raspberries, Cranberries, Mushrooms, Fiddleheads, and Antler Sheds

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The primary use is recreational gathering of blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds. "Tipping," the collection of evergreen boughs for the making of wreaths, and the cutting of evergreens for Christmas trees is not included under this compatibility determination and is not allowed. 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 (Public Law 105-57).

(b) Where would the use be conducted?
The use would be allowed on the Sunkhaze Meadows Unit of the refuge (map B.10).

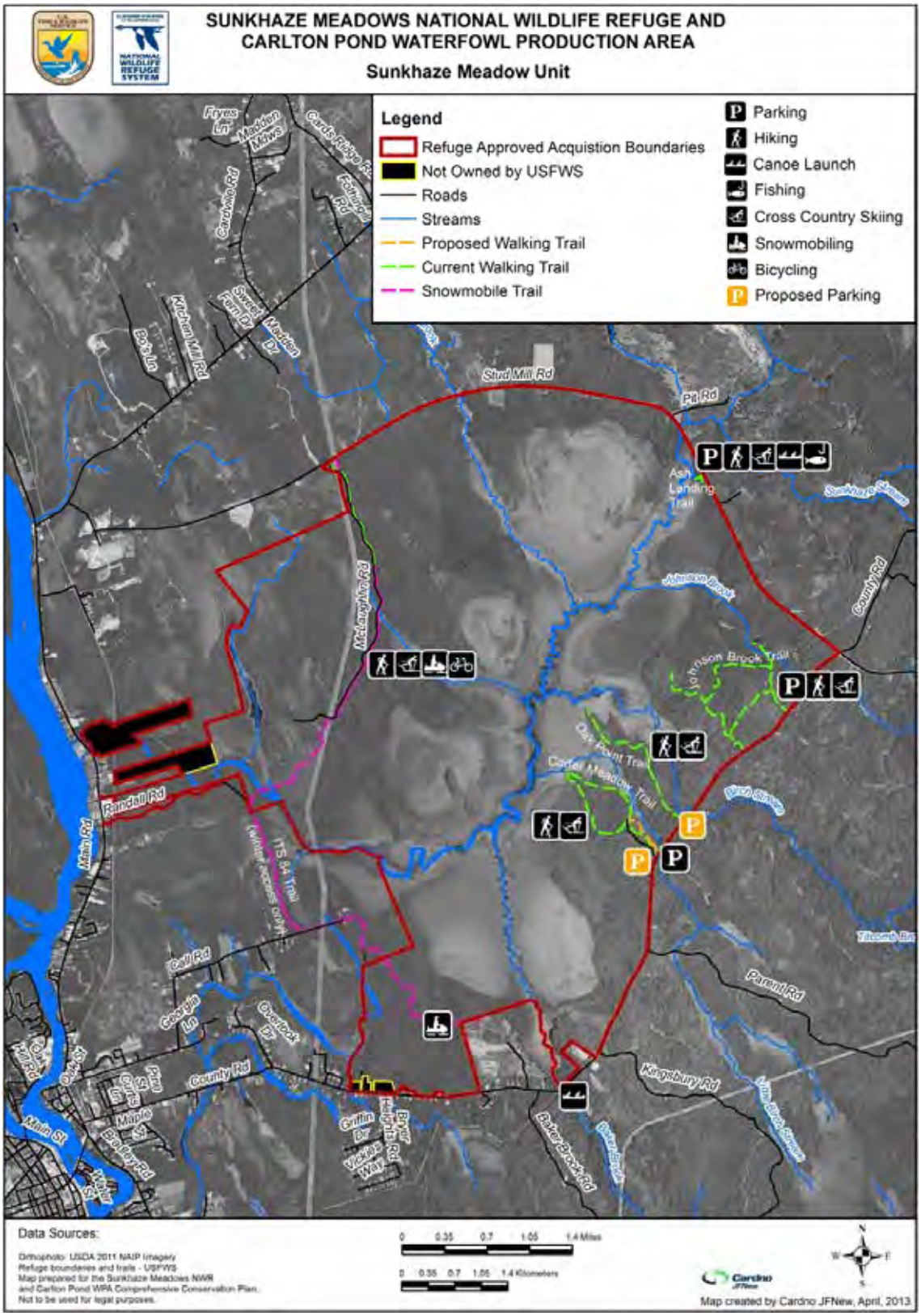
(c) When would the use be conducted?
These uses are seasonal in nature, as they naturally occur. Antler sheds are typically found during the late winter to early spring. Fiddleheads are typically gathered in early spring. Blueberries, blackberries, strawberries, raspberries, and cranberries are typically gathered from July to September and mushrooms may be available at varying times during the growing season.

(d) How would the use be conducted?
We would allow recreational gathering of blueberries, blackberries, strawberries, raspberries, cranberries, mushrooms, fiddleheads, and antler sheds for personal use on the Sunkhaze Meadows Unit. The gathering of these materials is an historic use of the unit and fosters a connection to, and appreciation for, the area's natural resources. We recognize that picking and gathering blueberries, strawberries, raspberries, blackberries, cranberries, mushrooms, fiddleheads, and antler sheds has occurred on the Sunkhaze Meadows Unit 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 authorized for gathering on this unit would be for private use only. Any sale of these materials would be considered a commercial use of these materials and is prohibited by Federal law.

Raspberries, strawberries, blackberries and blueberries are found in refuge fields and woodlands. Cranberries are found in a few specific locations in the Sunkhaze Meadows bog. Visitors participating in this use park at refuge parking areas and walk along the Buzzy Brook, Oak Point or Johnson Brook Trails. Berry picking is often incidental to walking and hiking along these trails. The vast majority of berry picking occurs along the 8 miles of designated trails on the Sunkhaze Meadows Unit. These trails are located in the spruce-fir-deciduous upland that surrounds the Sunkhaze Meadows bog. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing). Some visitors may come specifically to engage in berry picking or other allowed collecting; this is one more way to engage the public in getting outdoors and observing wildlife. Berry pickers are limited to collecting only enough for personal or family consumption. Nearly all berries that are collected are consumed in the field. All areas of the refuge are open to this activity, but physical access to areas beyond the trail system is difficult and this rarely occurs. Biting insects discourage even the hardiest visitors during the summer.

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 plants (other than mushrooms and fiddleheads) are to be removed from the refuge.

Map B.10. Gathering is allowed in the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge as stipulated in this compatibility determination.



(e) Why is this use being proposed?
Gathering of these natural materials has occurred in the area for many years and this use was specifically requested by the public while we were developing the comprehensive conservation plan (CCP) for Sunkhaze Meadows NWR. Current use levels for this activity are very low and the use primarily occurs along roads and in disturbed areas like log landing and roadsides. This use is typically a family activity and provides an opportunity for families to connect with the natural environment. While people engage in this activity they often observe and gain an appreciation for wildlife and refuge habitats.

AVAILABLITY 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 which assesses interactions among user groups and any related user impacts. Resource impacts would 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.

Costs associated with gathering natural materials are estimated below:

Law enforcement–patrol/visitor-resource protection/ public use monitoring/enforcement/outreach:	$2,000 GS-9 Refuge Officer
Resource impacts/monitoring:	$1,000 GS-11 Wildlife Biologist
Total:	**$3,000**

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 National Wildlife Refuge System, and the 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.

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.

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.

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. Under current 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.

Since this unit is are fairly flat, erosion is not a large problem, but impacts to wet areas can occur when bridging is inadequate and visitors widen or go off the trail to avoid wet spots. Properly sited, designed, and maintained trails minimize this impact. Based on the current level 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.

Habitat Impacts:
Peatlands are particularly vulnerable to damage by visitors who may walk through them or collect plants. At Sunkhaze Meadows Unit, the peatlands are difficult to access due to the large area of wetlands that exist between the streams and the peat domes; there are no designated trails to access these sensitive areas. Plant collecting is also prohibited. Visitors wishing to see a bog can visit the boardwalks that access the nearby Orono Bog.

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 Knight1998), 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 wildlife observation, photography, environmental education, and interpretation 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 no known federally listed threatened or endangered species occurring on the Sunkhaze Meadows Unit; therefore, this activity is not expected to impact any threatened or endangered species here. 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. In addition, wildlife observers and photographers generally seek to minimize disturbance, as it interferes with their activity.

Summary of Impacts:
We do not expect these disturbances to be significant, i.e. cause wildlife or habitats to be negatively impacted, since current and anticipated levels of use are low. Providing the opportunity for recreational gathering of natural materials on the refuge provides the public with an opportunity to observe wildlife and to view Service wildlife habitat management projects. There have been no indications that the current levels of limited harvesting of these natural materials causes problems for wildlife other than minimal and temporary disturbance caused by the mere presence of humans. Due to the great numbers of mosquitoes and other biting insects during this time period, the actual number of refuge visitors is quite low. Any berry picking that occurs is incidental and is usually limited to areas near roads and trails.

PUBLIC REVIEW AND COMMENT:

As part of the CCP process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__
This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

On the Sunkhaze Meadows Unit:

- A refuge officer would help to promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions.

- Refuge staff would promote good harvest practices through communicating with the public when new information on harvesting comes out. Example: when harvesting fiddleheads you should limit take of three heads per plant to ensure a healthy plant in the future (so the plant is not killed). No digging is permitted at any time.

- Refuge staff would continue to monitor the unit for the presence of federally threatened or endangered species and ensure this use continues to have an insignificant impact on wildlife. We may close some or all of this unit to this use if significant wildlife or habitat disturbance is identified.

- Pets must be leashed.

- The Sunkhaze Meadows Unit would be open to this use during regular refuge hours, sunrise to sunset.

JUSTIFICATION:

Recreational gathering of these materials at the Sunkhaze Meadows Unit would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System or the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. These uses do not adversely impact the wildlife and habitat protection aspects of the purposes because at the scales and level of current visitor use, wildlife and habitats are not appreciably negatively affected by these uses. We have made this determination based on lack of observed habitat degradation and because the use is focused around established trails. Recreational gathering of the specified materials would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species that occur on the refuge. Therefore, no significant adverse effects from this use is anticipated. Allowing these uses does not affect CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013) and may support the refuge's purpose associated with allowing wildlife-oriented recreational opportunities. These activities would not materially interfere with or detract from the mission of the Service, because of the limited impacts to refuge resources and the opportunity to build support for the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure, and defense against floaters by territorial male song sparrows. Animal Behavior 35:773-784.

Batten, L.A. 1977. Sailing on reservoirs and its effects on water birds. Biological Conservation 11:49-58.

Bauer, H.G., H. Stark, P. Frenzel. 1992. Disturbance factors and their effects on water birds wintering in the western parts of Lake Constance. Der Ornithologische Beobachter 89(2):81-91.

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36-41.

Bouffard, S.H. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Transactions of the North American Wildlife and Natural Resource Conference 47:553-558.

Boyle, S.A., and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation.

Butler, J.R. 1984. The myths, the reality, and the challenges of managing for the non-consumptive wildlife user. *In* W. C. McComb, editor and compiler. Proceedings of the Workshop on Management of Nongame Species and Ecological Communities. University of Kentucky, Department of Forestry, Lexington, Kentucky. 404 pp.

Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123-130.

Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. Journal of Comparative Physiological Psychology 95:676-684.

——— 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. Environmental Conservation 22:56-65.

Cairns, W.E., and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. American Birds 34: 206-208.

Carlson, L.H., and P.J. Godfrey. 1989. Human impact management in a coastal recreation and natural area. Biological Conservation.

Cassirer, E.F., D.J. Freddy, E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. *In:* Hendee, J.C., G.H. Stankey, R.C. Lucas. eds., Wilderness Management.

Cole, D.N., and P.B. Landres. 1995. Indirect effect of recreation on wildlife in Knight, R.L, and K.J. Gutzwiller, eds. 1995. Wildlife and Recreationists—Coexistence Through Management and Research. Washington, DC. Island Press.

Dearden, P., and C.Hall. 1983. Non-consumptive recreation pressures and the case of the Vancouver Island marmot (*Marmota vancouverensis*). Environmental Conservation. Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation 18:39-51.

Evenson, D., C. Hopkins, and G. Martz. 1974. Waterfowl and waterfowl hunting at Houghton Lake. Michigan Department of Natural Resources, Wildlife Division, Infor. Circ. 171, Lansing, Michigan. 7pp.

Ewald, P.W., and F.L Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31:277-292.

Ferguson, M.A.D., and L.B. Keith. 1982. Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. Canadian Field-Naturalist.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and in snowmobiles. Wildlife Society Bulletin 14:63-68.

Goff, G.R., D.J. Decker, and G. Pomerantz. 1988. A diagnostic tool for analyzing visitor impacts on wildlife refuges: a basis for a systematic approach to visitor management. Transactions of the Northeast Section of the Wildlife Society.

Goodrich, J.M., and J. Berger. 1994. Winter recreation and hibernating black bears *Ursus americanus*. Biological Conservation. Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of human intrusion on son occurrence and singing consistence in subalpine birds. The Auk 111(1):28-37.

Hall, D., and P. Dearden. 1984. The impact of non-consumptive recreation on wildlife: an annotated bibliography.

Hammitt, W.E., and D.N. Cole. 1998. Wildland Recreation. John Wiley & Sons, New York, 361 pp.

Hartman, G.W. 1972. The biology of dump nesting in wood ducks. M.S. thesis, University of Missouri-Columbia. 66pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin 19:248-257.

Johnson, R.E. 1964. Fish and fowl. Pages 453-458 *in* J.P. Linduska, ed., Waterfowl tomorrow. U.S. Department of Interior, Fish and Wildlife Service. U.S. Government Printing Office, Washington, DC.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Klein, M.L. 1989. Effects of high levels of Human Visitation on Foraging Waterbirds at J.N. “Ding” Darling NWR, Sanibel, Florida. Final Report to USFWS. 103 pp.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454-1465.

Knight, R.L., and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. *In:* Glinski, R.L., B.G. Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, S.W. Hoffman, C.E. Ruibal, D.L. Krahe, D.L. Owenseds., Proceedings of the southwest raptor management symposium and workshop.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Trans. 56th National Association of Wildlife and Natural Resources Conference. Pp. 238-247.

——— 1995. Wildlife responses to recreationists. Pp. 51-69 in: Knight, R.L. and K.J. Gutzwiller eds., Wildlife and recreationalists: coexistence through management and research. Island Press, Washington, DC. 372 pp.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Korschgen, C.E., and R.B. Dahlgren. 1992. Human disturbances of waterfowl: causes, effects, and management. U.S. Fish and Wildlife Leaflet 13.2.15: 8pp.

Kuss, F.R., and A.R. Graefe. 1985. Effects of recreation trampling on natural area vegetation. Journal of Leisure Research.

Kuss. F. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management. 10:638-650.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pp. 249-297 in: A. Sprunt IV, J.C. Ogden, and S. Winckler, eds., Wading Birds. National Audubon Society, New York, New York.

Marion, J.L., and D.W. Lime. 1986. Recreational resource impacts: visitor perceptions and management responses. In: Kulhavy, D.L. and R.N. Conner eds., Wilderness and natural areas in the eastern United States: a management challenge.

Mathews, G.V.T. 1982. The control of recreational disturbance. Pages 325-330 *in* D.A. Scott, ed., Managing wetlands and their birds, a manual of wetland and waterfowl management. Proceedings 3rd Technical Meeting on Western Palearctic Migratory Bird Management, Biologishche Station Rieselfelder Münster, Federal Republic of Germany, 12-15 October 1982.

McNeil, R., P. Drapeau, and J.D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. Biological Review 67:381-419.

Mickelson, P.G. 1975. Breeding biology of cackling geese and associated species on the Yukon-Kuskokwim Delta, Alaska. Wildlife Monograph 45, The Wildlife Society, Washington, DC. 35pp.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

——— 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.

More, T.A. 1979. The demand for nonconsumptive wildlife uses: a review of the literature.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53: 401-410 (also see corrigendum in Journal of Wildlife Management 54:683).

Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, N.A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges.Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130

Reichholf, J. 1976. The influence of recreation activities on waterfowl. Pages 364-369 *in* M. Smart, ed., Proceedings of the International Conference on Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December 1974. International Waterfowl Research Bureau, Slimbridge (Glos), England.

Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

——— 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Speight, M.C.D. 1973. Outdoor recreation and its ecological effects: a bibliography and review. University College, London, England, Discussion Paper Conservation 4. 35pp.

Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: a handbook for trail planners. Colorado State Parks, Denver, Colorado. 51pp.

U.S. Fish and Wildlife Service (USFWS). 1988. Final environmental assessment, proposal to establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge preliminary station management plan.

———1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

Van der Zande, A.N., J.C. Berkhuizen, H.C. Van Latesteijn, W.J. Ter Keurs, A.J. Poppelaars. 1984. Impact of outdoor recreation on the density of a number of breeding bird species in woods adjacent to urban residential areas. Biological Conservation.

Vaske, J.J., A.R. Graefe, and F.R. Kuss. 1983. Recreation impacts: a synthesis of ecological and social research. Transactions of the North American Wildlife and Natural Resource Conference 48:96-107.

Ward, D.H., and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife

Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Boating

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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__X__**

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: Sunkhaze Meadows National Wildlife Refuge

Use: Boating

Narrative

Boating is an historic use of Sunkhaze Meadows National Wildlife Refuge (refuge) that occurred before the refuge was created. Hunting, fishing, wildlife observation and photography, and environmental education and interpretation are the six priority public uses of the National Wildlife Refuge System (Refuge System). The Refuge System Improvement Act of 1997 instructs refuge managers to seek ways to accommodate those six uses. Motorized and non-motorized boating is an appropriate means of facilitating these priority public uses on the refuge since much of the refuge is only accessible by water. Jet Skis would not be permitted on refuge waters due to their environmental impact, noise, speed, and excessive wildlife disturbance. There a currently no motor or speed limitations since the refuge waterways are so narrow and beaver dam obstructions limit their use. The use has been allowed on the refuge since it was established with no significant adverse effects observed. The staff would continue to monitor the use and could implement both motor and speed limitations if wake or speeds become harmful to wildlife or habitat, or in the interest of public safety.

By allowing this use, we are providing opportunities and facilitating refuge programs in a manner and location that offer high-quality, wildlife-dependent recreation and maintains the level of current fish and wildlife values. For these reasons, we have determined that allowing this use is consistent with the U.S. Fish and Wildlife Service policy on the appropriateness of refuge uses.

COMPATIBILITY DETERMINATION

USE: Boating

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)), "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:

"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."(16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

The use is motorized and non-motorized boating. Motorized and non-motorized boating are not a priority public use of the National Wildlife 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, however they facilitate priority public uses.

Refuge visitors often use small boats, motorized and non-motorized, on refuge streams to access otherwise inaccessible portions of the refuge in support of fishing, hunting, environmental education, wildlife photography, and wildlife observation.

(b) Where would the use be conducted?

Motorized and non-motorized boating would continue to be allowed on all open waters within the Sunkhaze Meadows Unit of the refuge.

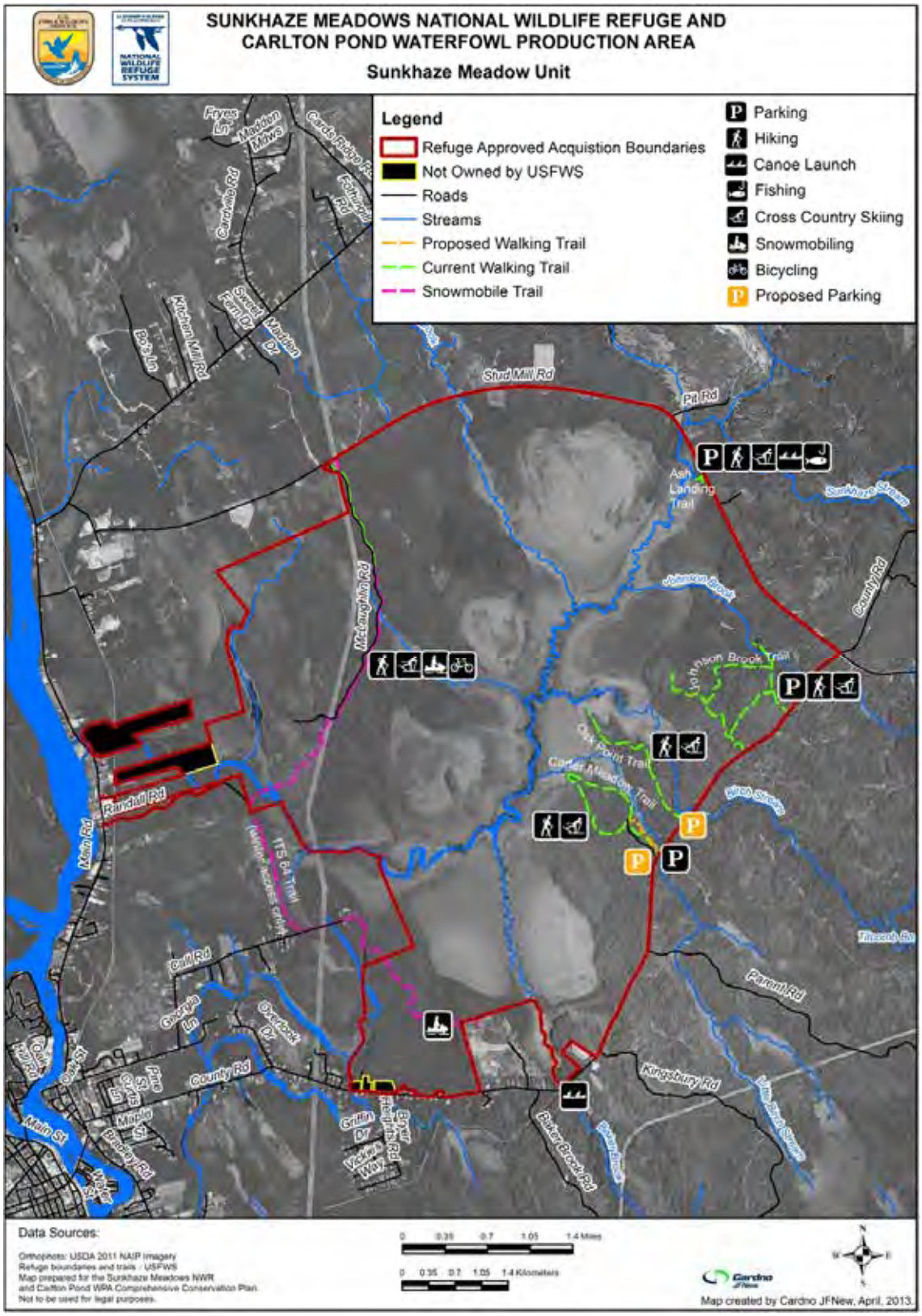
(c) When would the use be conducted?
Motorized and non-motorized boating would be allowed year round when waters are ice-free from sunrise to sunset and one hour before and after sunset in support of hunting.

(d) How would the use be conducted?
Visitors would use parking lots at Ash Landing and on the Penobscot River off Route 2 near the mouth of Sunkhaze Stream. A trailhead kiosk is located at Ash Landing and a roadside interpretive display is located at the Route 2 site. At present, trailered boats can only be launched at the Route 2 site, and entry from there includes traversing a shallow area in the mouth of the stream, limiting boat and engine size most of the year; the exception would be when the Penobscot River floods in spring, backing up into the Sunkhaze Meadows and flooding it. At that time, larger boats with 25 horse power engines may use the area. Canoes and kayaks launched from the Route 2 site have a long way to paddle on the Penobscot to get to the mouth of Sunkhaze Stream. At Ash Landing, boats and motors must be carried a small distance from the parking lot to reach the stream. In addition, the upper portion of Sunkhaze Stream south of Ash Landing contains a dozen or so beaver dams to be passed over. These conditions generally limit the size of boats using the stream within the refuge to john boats, canoes, and kayaks, with no, or relatively small motors.

All boats launching or landings on refuge lands must follow State boating regulations and, if applicable, show State registration. Maine Statute Title 38: 419B-420 prohibits the transport of any aquatic plant or parts of any aquatic plant, including roots, rhizomes, stems, leaves or seeds, on the outside of a vehicle, boat, personal watercraft, boat trailer or other equipment on a public road. The public should inspect all boats and boat trailers and clean them of aquatic invasive species before launching at refuge sites. That cleaning should take place on dry ground well away from the water. Nonnative, invasive plants or animals on boats, trailers, diving equipment, or in bait buckets can disrupt aquatic ecosystems and negatively affect native fish and plant species. Sunkhaze Stream and its associated tributaries appear to be relatively free of aquatic invasive plants, and cleaning boats, trailers, and other equipment would help to keep them that way. Signs, public outreach, and periodic enforcement would help educate and remind the public of the importance of inspecting and cleaning watercraft and Maine State laws prohibiting transport of aquatic plants.

(e) Why is the use being proposed?
Hunting, fishing, wildlife observation and photography, and environmental education and interpretation are the six priority public uses of the Refuge System. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses. Motorized and non-motorized boating facilitate these priority public uses. By allowing this use, we are providing opportunities and facilitating refuge programs in a manner and location that offer high quality, wildlife-dependent recreation and maintain the level of current fish and wildlife values. Most of the refuge would be inaccessible to the public without using a boat. This use may also provide individuals with a connection to the natural world and an increased appreciation of natural resources, in addition to exposing them to the Refuge System.

Map B.11. Boating is allowed in all streams and tributaries within the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge as stipulated in this compatibility determination.



AVAILABLITY OF RESOURCES:

Facilities or materials needed to support boating include annual maintenance of the parking and trail at Ash Landing, signing and monitoring of boating access points including the launch on Route 2, and routine law enforcement patrols. The refuge plans to upgrade the hand carry boat launch and access trail at Ash Landing which is a funded project in the 2012 budget. These costs ($7,000) are not included in the budget projection for public fishing and would be a one year cost.

Annual maintenance for parking area and trail to Ash Landing boat launch:	$500
Signing and monitoring boat access sites:	$300
Law enforcement patrol:	$2,000
Update interpretive/informational trailhead signage	$600
Program Cost:	**$3,400**

ANTICIPATED IMPACTS OF THE USE:

Accidental introduction of invasive plants, pathogens, or exotic invertebrates, **attached to fishing boats:** With the exception of a few isolated occurrences of purple loosestrife, refuge waters appear to be relatively free of invasive aquatic plants and mollusks. However, we have not carried out extensive surveys of aquatic invasives. We can mitigate the potential for introductions by having boaters clean their boats before launching and after retrieving. We would also post launch sites with educational materials and have law enforcement officers make courtesy spot checks of vessels for compliance and to educate boaters on proper methods for checking for aquatic hitchhikers.

Disturbance of wildlife: Boating seasons in Maine coincide in part with spring-early summer nesting and brood-rearing periods for many species of aquatic-dependent birds. Anglers and other boaters may disturb nesting birds by approaching too closely to nests, causing nesting birds to flush. Flushing may expose eggs to predation or cooling, resulting in egg mortality. If this becomes a problem we would close refuge areas seasonally to boating around sensitive nest sites, in conjunction with the state of Maine if necessary.

Though motorized boats generally have a greater impact on wildlife, even non-motorized boats can alter distribution, reduce use of particular habitats by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). However, compared to motorboats, canoes and kayaks appear to cause fewer disturbances to most wildlife species (Delong 2002). The refuge waterways restrict motor and boat size due to the number of beaver dams you must cross. The only time a larger boat can access the refuge is during spring flood, before most migratory species have arrived. If we encounter problems in the future, we could implement a size limit; thus far it has not been an issue and most people don't use a motor due to the hassle.

Negative impacts on water quality from motorboat and other pollutants, human waste, and litter: Extensive water quality testing on Sunkhaze Stream and its tributaries has not been carried out. The levels of pollutants from boat fuel and impacts on local aquatic systems are unknown.

Hydrocarbon contamination can be harmful to fish. Currently most boating is non-motorized so we feel there is little contamination coming from this source. We would initiate public outreach and education on littering, pollutants, and proper waste disposal if the use increases substantially above current use levels to help mitigate water quality impacts. Water quality testing would be carried out as funding levels permit.

Bank and trail erosion from human activity (boat landings, boat wakes) may increase aquatic sediment loads of streams and rivers, or alter riparian or streamside habitat/vegetation in ways harmful to fish or other wildlife. Boat access would be restricted to designated areas only. The trail to the Ash Landing boat launch would be 'hardened' to further reduce any erosion potential. Therefore, at current levels of use, we do not expect trail erosion to increase because of foot traffic related to boating. 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, therefore we do not anticipate any significant bank erosion due to boat wakes.

Negative impacts from fishing boats and foot traffic to sensitive wetlands or peatlands and rare wetland plants. Boat access sites and trails are located away from sensitive wetlands, peatlands, and rare plants.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Boating access areas have been designated and signed.
- Refuge staff would continue to monitor the refuge for the presence of threatened or endangered species and ensure that boat use has no significant impact on them. If needed in the future, closure of any stream or portion thereof would be coordinated with the State of Maine which maintains jurisdiction in navigable waters.
- Motor or speed limitations could be implemented if wake or speeds become harmful to wildlife or habitat, or in the interest of public safety.

- Jet skis would not be permitted on refuge waters due to the potential for environmental impact, noise, speed, and excessive wildlife disturbance.

- All boats, trailers, motors, and fishing gear would be encouraged to be inspected by the owner for plant material and cleaned prior to launching and after retrieval.

- Compliance with regulations would be achieved through education, signage and law enforcement which would result in minimizing negative impacts to refuge habitat and wildlife.

- The refuge would be open to this use during regular refuge hours, sunrise to sunset.

JUSTIFICATION:

While boating is not a priority public use of the National Wildlife Refuge System (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997), it does facilitate priority public uses, particularly at the Sunkhaze Meadows Unit which largely consists of wetlands and streams.

Allowing boating at Sunkhaze NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, boating is a use that supports wildlife-dependent priority public uses with minimal adverse impacts on refuge resources. Use by boaters is estimated to be less than 700 visits per year. Due to numerous other opportunities in the area, the demand for boating is expected to be relatively constant in the future. Waterfowl use tributary stream and pothole habitats in the meadows portion of the refuge more heavily than Sunkhaze Stream where most boating occurs, so minimal and temporary disturbance of waterfowl is anticipated from boating activity there. Erosion of stream banks by wakes from motorized boats is insignificant since most boating is non-motorized and dense vegetation and thickly matted roots protect the bog edge. Because of this, it is consistent with the wildlife and habitat aspects of the refuge's purposes, the Service policy on compatible uses, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System.

Boating would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species known to occur on the refuge. Therefore, no significant adverse effects from boating are anticipated. By supporting priority public uses, allowing this use supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013) and the refuge's purpose associated with allowing wildlife-oriented recreational opportunities. This activity would not materially interfere with or detract from the mission of the Refuge System, because of the limited impacts to refuge resources, it facilitates priority public uses, and the opportunity to attract visitors to the refuge and build support for the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY:

Bauer, H.G., H. Stark, P. Frenzel. 1992. Disturbance factors and their effects on water birds wintering in the western parts of Lake Constance. Der Ornithologische Beobachter 89(2): 81-91.

Bouffard, S.H. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Transactions of the North American Wildlife and Natural Resources Conference 47:553-558.

Boyle, S.A., and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: a review. Wildlife Society Bulletin 13:110-116.

DeLong, A. 2002. Managing visitor use and disturbance of waterbirds. a literature review of impacts and mitigation measures. Appendix L in: Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision, Volume 2. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, Oregon. 114 pp.

Evenson, D., C. Hopkins, G. Martz. 1974. Waterfowl and waterfowl hunting at Houghton Lake. Michigan Department of Natural Resources, Wildlife Division, Infor. Circ. 171, Lansing, Michigan. 7pp.

Hartman, G.W. 1972. The biology of dump nesting in wood ducks. M.S. thesis, University of Missouri-Columbia. 66pp.

Johnson, R.E. 1964. Fish and fowl. Pages 453-458 *in:* J.P. Linduska, ed., Waterfowl tomorrow. U.S. Department of Interior, U.S. Fish and Wildlife Service. U.S. Government Printing Office, Washington, DC.

Knight, R.L., and D.N. Cole. 1995. Wildlife responses to recreationists. Pages 51-70 *in:* R.L. Knight and K.J. Gutzwiller, eds., Wildlife and recreationists: coexistence through management and research. Washington, DC: Island Press.

Korschgen, C.E., and R.B. Dahlgren. 1992. Human disturbances of waterfowl: causes, effects, and management. U.S. Fish and Wildlife Leaflet 13.2.15: 8pp.

Mathews, G.V.T. 1982. The control of recreational disturbance. Chapter 42. Pages 325-330 *in:* D.A. Scott, ed. Managing wetlands and their birds, a manual of wetland and waterfowl management. Proceedings 3rd Technical Meeting on Western Palearctic Migratory Bird Management, Biologishche Station Rieselfelder Münster, Federal Republic of Germany, 12-15 October 1982.

Mickelson, P.G. 1975. Breeding biology of cackling geese and associated species on the Yukon-Kuskokwim Delta, Alaska. Wildlife Monograph 45, The Wildlife Society, Washington, DC. 35pp.

Ogilvie, M.A. 1981. The mute swan in Britain, 1978. Bird Study 28:87-106.

Reichholf, J. 1976. The influence of recreation activities on waterfowl. Pages 364-369 *in:* M. Smart, editor. Proceedings of the International Conference on Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December 1974. International Waterfowl Research Bureau, Slimbridge (Glos), England.

Speight, M.C.D. 1973. Outdoor recreation and its ecological effects: a bibliography and review. University College London, England. Discussion Paper Conservation 4. 35pp.

U.S. Fish and Wildlife Service (USFWS). 1988. Final Environmental Assessment, Proposal to Establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge Preliminary Station Management Plan.

——— 1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Privately-owned Recreational Cabin

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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_X_**

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: Sunkhaze Meadows National Wildlife Refuge

Use: Privately-owned Recreational Cabin

Narrative

The Spruce cabin is one of five cabins that were on Sunkhaze Meadows National Wildlife Refuge (refuge) at the time of its establishment. The cabin has occupied leased land from Diamond Occidental Forest Inc., the previous landowner, for many decades. We phased out the other four private cabins as the historic lease holders declined the option to obtain or renew their special use permits (SUP). One cabin was purchased during refuge acquisition, and the other three were purchased in the years following refuge establishment. One privately owned cabin remains. We manage this use by issuing a SUP and charging the owner an annual fee. The fee is adjusted annually to reflect changes in the cost of living. As part of phasing out use of private cabins, we do not intend to issue SUPs to anyone but the present owner. We expect to purchase this last cabin when the owner is no longer interested in renewing the annual SUP. In the meantime, this use has little impact on refuge management activities, wildlife, or wildlife habitat since the site has been occupied for nearly 100 years. As documented in this form, 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: Occupancy and Use of a Privately Owned Recreational Cabin

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)), "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is the occupancy and use of a privately owned recreational cabin. It is not a priority public use of the National Wildlife 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.

The cabin is one of five cabins that were on the refuge at the time of its establishment. The cabin has occupied land leased from Diamond Occidental Forest Inc., the previous landowner, for many decades. We phased out the other four private cabins as the historic lease holders declined the option to obtain or renew their special use permits (SUP). One cabin was purchased during refuge acquisition, and the other three were purchased in the years following refuge establishment. A single cabin remains, which is managed through the issuance of a SUP and charging of an annual fee. The fee is adjusted annually to reflect changes in the cost of living. As

part of phasing out the use of private cabins, we do not intend to issue SUPs to anyone but the present owner. We expect to purchase this last cabin when the owner is no longer interested in renewing the annual SUP.

(b) Where would the use be conducted?
The use would occur at the cabin site located on Carter Meadow Road just north of the County Road in the town of Milford.

(c) When would the use be conducted?
The cabin is occupied sporadically throughout the year with highest use occurring during the summer months. The cabin has been used during these times at this site for almost 100 years.

(d) How would the use be conducted?
Under Service land ownership, the use and occupancy of this camp would be administered through the issuance of an SUP, the conditions of which are analogous to the former lease. We would review and issue the permit annually. The annual fee is adjusted annually to reflect changes in the cost of living. The cabin owner is allowed to access the cabin off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

As part of phasing out use of private cabins, we do not intend to issue SUPs to anyone but the present owner. We expect to purchase this last cabin when the owner is no longer interested in renewing the annual SUP.

(e) Why is the use being proposed?
This use existed before refuge ownership and has been managed in this manner since refuge establishment in 1988. At the time of Service acquisition from Diamond Occidental Forest Inc. there were five cabins, built by families that were leasing the underlying land. Since refuge establishment, the Service has purchased four of the cabins and phased them out. By working with the last cabin owner, the Service is following through on earlier commitments which were made at the time of sale.

AVAILABLITY OF RESOURCES:

The refuge staff time associated with administering this use primarily relates to processing annual permit fees, answering the questions of the cabin owner concerning conditions of the permits, monitoring compliance with those conditions, and monitoring potential impacts of the use on refuge resources and visitors. Costs associated with administration of this use include:

Reviewing SUP conditions, landowner contacts:	$100	GS-13 Refuge Manager
Issuing SUP:	$30	GS-6 Administrative Assistant
Cabin Monitoring:	$200	GS-9 Refuge Officer
Total:	**$330**	

Based on a review of the budget allocated for management of this cabin, 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:

This cabin site has little impact on refuge management activities, wildlife, or wildlife habitat since the site has been occupied for nearly 100 years. The cabin is located along a road which provides walking access to Carter Meadow Trail which is adjacent to the cabin. Activities by the cabin owner do not differ substantially in intensity from those of the general public in allowed, daily uses. The occasional occupancy of the cabin could disturb resident wildlife, such as chipmunks, squirrels, mice, skunks, and a few species of songbirds, but these impacts would be temporary, localized, and not significant. No impacts are expected on any threatened or endangered species, whether federally or State listed species.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

The conditions for the SUP for the cabin would be reviewed annually to ensure continued compatibility. Current conditions of the permit include:

- The permittee is responsible for removing all trash from the refuge and disposing of it in approved trash dumps.

- Refuge staff would inspect the cabin site at least once a year to ensure that all provisions and conditions of the SUP are being followed. If conditions are not being met, the permittee would be notified in writing and given a minimum of 30 days to comply. Failure to do so would result in revocation of the permit.

- The permittee is responsible for the payment of personal property tax as assessed by and to the town of Milford, Maine. Failure to pay would result in revocation of the permit.

- The permit does not grant the permittee the right to erect any additional buildings or improvements to the cabin site without prior notification and approval of the refuge manager.

JUSTIFICATION:

This use has been determined to be compatible, provided that the conditions of the SUP are implemented. The use would not pose significant adverse effects on trust species or other refuge resources, would not interfere with public use of the refuge, or cause an undue administrative burden. For these reasons, we have determined that continuing to allow this use on the refuge would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System or the purposes for which the refuge was established

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Bicycling on McLaughlin Road

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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 _X__ 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__X___**

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: Sunkhaze Meadows National Wildlife Refuge

Use: Bicycling on McLaughlin Road

Narrative

Bicycling is an historic recreational use of Sunkhaze Meadows National Wildlife Refuge (refuge) that occurred before the refuge was created, and has occurred on the refuge since its establishment. Hunting, fishing, wildlife observation and photography, and environmental education and interpretation are the six priority public uses of the National Wildlife Refuge System (Refuge System). The Refuge System Improvement Act of 1997 instructs refuge managers to seek ways to accommodate those six uses. Bicycling can facilitate these priority public uses and provide the public with an additional way to enjoy the great outdoors. This use is also consistent with the environmental assessment prepared for the refuge's establishment (USFWS 1988, pg. 35). Current levels of this use are low and not expected to increase substantially. No adverse impacts have been observed.

For these reasons, we have found 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). 1988. Final environmental assessment: proposal to establish Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 5. Newton Corner, Massachusetts. 56 pp.

COMPATIBILITY DETERMINATION

USE: Bicycling

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

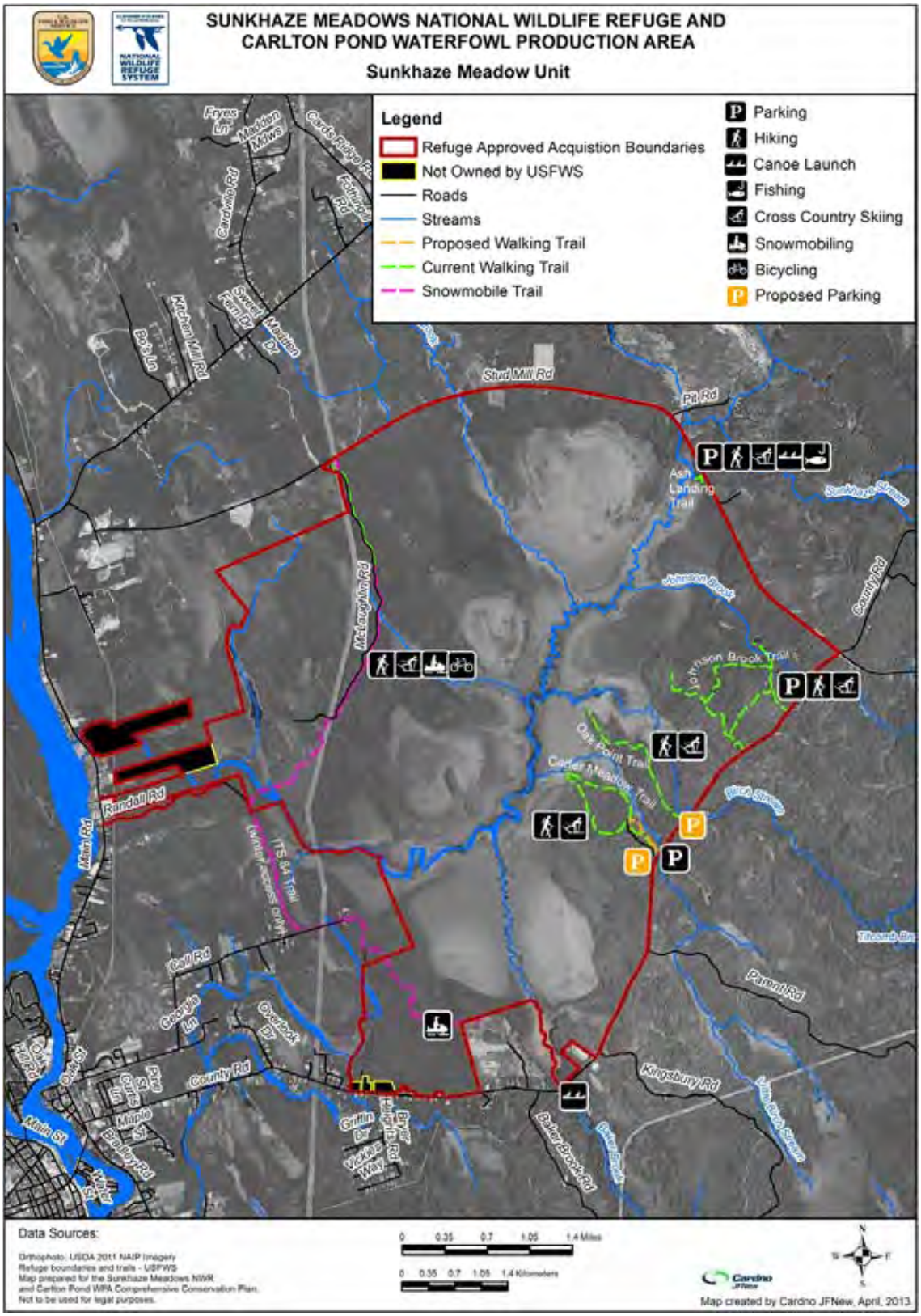
MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
Allow bicycling at Sunkhaze Meadows NWR, only on McLaughlin Road. This use is not a priority public use of National Wildlife 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?
Bicycling would be limited to the dirt-surfaced McLaughlin Road, where this use has been allowed in the past. Bicycling on the hiking trails or off-trail would not be allowed.

Map B.12. Public use infrastructure including authorized bicycling location at the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



(c) When would the use be conducted?
Use would be allowed during the refuge's normal open hours. The refuge is open daily sunrise to sunset. People bicycle in every season except winter, when snow cover impedes this activity. There is a locked gate on the McLaughlin Road intended to exclude cars and trucks to protect the road, especially during mud season, but bicycles would be able to pass. This gate is left open during the hunting season.

(d) How would the use be conducted?
Bicyclists would either drive with bikes on car racks and park at Ash Landing, or ride for many miles on other dirt roads to get to the McLaughlin Road. The use would be self-regulating, with signs and brochures indicating the availability of this road for this use. Should damage be caused from bicycles using the road when it is very muddy, signs would be put up to close the road to bicycles during particularly muddy time periods. If bicyclists go on trails closed to bicycling or off-trail, our law enforcement officer would enforce refuge restrictions.

Groups of 10 cyclists or more would be required to obtain a special use permit (SUP), allowing the refuge to monitor how much of this kind of use is occurring. No motorcycles or engine powered cycles of any kind would be allowed.

(e) Why is the use being proposed?
This is an ongoing use of the refuge, and has been occurring without any evidence that it is disruptive or causing any damage. Bicyclists currently bike on the dirt roads bordering and surrounding the Sunkhaze Meadows Unit, County Road and Stud Mill Road. Allowing bicycling on the dirt McLaughlin Road increases their options and introduces them to the refuge, encouraging them to engage in wildlife observation. Allowing it would encourage those people who enjoy the outdoor sport of bicycling to visit the refuge and enjoy it.

AVAILABLITY OF RESOURCES:

The refuge maintains the McLaughlin Road for other management purposes. Allowing occasional bicycles on this road would not increase the maintenance or operational needs.

Law Enforcement Patrol:	$800
Total:	**$800**

Based on a review of the budget allocated for management of this activity, I certify that funding is adequate to ensure compatibility, 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:

Bicycling has the potential to affect a variety of migratory and resident wildlife and their habitats. Possible negative effects include disturbing wildlife, removing or trampling vegetation, littering, vandalism, and entering closed areas. Refuge staff would monitor the impacts of this use on McLaughlin Road to assess potential negative effects. In the event of persistent disturbance to habitat or wildlife, the activity would be restricted or discontinued.

Effects on Soils: Bicycle wheels can cause physical impacts to soil surfaces. Cessford (1995) notes the shearing action of wheels creates damage to roads and trails, which increases when conditions are wet or when traveling up a steep slope. When traveling down slope, skidding with hard braking can result in loosening soil surfaces, which leads to rutting and erosion by channeling water down wheel ruts. If braking is not performed on downhill travel, the impact of tires on the slope will be much less damaging (Cessford 1995). Since McLaughlin Road is relatively flat and is a hardened surface (gravel and compacted dirt) designed to withstand truck traffic, this is not expected to be a major problem.

Effects on Hydrology and Water Quality: This use has the potential to introduce soil sedimentation from bicycling into small streams and wetlands. The refuge minimizes adverse effects on water resources in a variety of ways. Refuge staff routinely monitor McLaughlin Road for damage and remediate problem areas as needed. These activities include maintenance of culverts, adding gravel and grading as necessary to control ruts, and brushing-in areas where "bootleg" trails are becoming evident. Through regular maintenance refuge staff would ensure any potential negative effects are avoided or minimized

As noted above, sedimentation problems would be minimized because McLaughlin Road is relatively flat and has hardened surfaces. Impacts would be more severe if cyclists go off road on existing trails or create "bootleg" trails. These activities are not allowed and would be dealt with by law enforcement.

Effects on Vegetation: Bicycle use can cause compaction of presently uncompacted soils, particularly when soils are wet, which can degrade plant communities associated with fragile organic soils. Soil compaction can diminish the soil porosity, aeration, and nutrient availability. These directly affect plant growth and survival (Kuss 1986). Compaction can also limit the re-colonization of areas due to increased difficulty for root growth and penetration in the affected soils (Hammitt and Cole 1998). Kuss (1986) found 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.

It is anticipated that bicycling would have no impacts on refuge plant communities, since bicycling is restricted to the road surface where the soil is already compacted and there are no plants. No rare plants have been documented in habitat adjacent to McLaughlin Road. Impacts of off-trail bike riding can be minimized through proper law enforcement.

Exposed soil and an abundance of sunlight along roads and trails provide ideal conditions for the establishment of invasive plant species. Bicycle use may impact vegetation and create bare soil conditions, thus creating conducive conditions for invasive species growth. Invasions result from the use of foreign material to construct and maintain roads and trails, and from seed transport via visitors and vehicles traveling on roads and trails.

Invasive plants, if allowed to establish and spread, can cause major damage to native plant assemblages and the wildlife they support. We would monitor for invasive species and control or eliminate them annually. We would take proper care in cleaning and maintaining all refuge equipment to avoid introduction or transport of invasive plants through refuge- or volunteer-based trail maintenance programs. Based on current monitoring results, invasive species presence along McLaughlin Road is low. Therefore it is likely that the current levels of bicycle

use and all other public uses permitted here are not causing significant increases in invasive plants relative to the current vegetative community on designated routes.

The refuge minimizes adverse effects on vegetation in a variety of ways. Refuge staff routinely monitor McLaughlin Road for damage and remediate problem areas as needed. Staff and volunteers also monitor the refuge for the presence of invasive species with the intent of controlling or eliminating them. Because bicycle use is limited to an existing road of packed earth or gravel, direct effects of vegetation impacts would be minimal.

If future evidence of unacceptable adverse impacts appears, we would close McLaughlin Road to this use.

Effects on Wildlife: Disturbances vary with the wildlife species involved and the type, level, frequency, duration and the time of year that human activities occur. The responses of wildlife to human activities include 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), the use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior or habituation (Burger 1981, Korschen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993, Whittaker and Knight 1998), attraction (Whittaker and Knight 1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Mammals may become habituated to humans making them easier targets for hunters. Disturbance can cause shifts in habitat use, abandonment of habitat and increased energy demands on affected wildlife (Knight and Cole 1991).

The effects of roads and trails on plants and animals are complex and not limited to the trail width. Trail use can disturb areas outside the immediate trail corridor (Trails and Wildlife Task Force 1998, Miller et al. 2001). Miller et al. (1998) describe a 75-meter zone of influence where bird abundance and nesting activities (including nest success) were found to increase 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 roads and trails, where common species (e.g., American robins) were found near trails and rare species (e.g., grasshopper sparrows) were found farther from trails. Songbird nest failure was also greater near trails (Miller et al. 1998).

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, makes males rely more heavily on physical deterrents in defending territories, which are time- and energy-consuming (Ewald and Carpenter 1978).

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).

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.’

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) note 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 breeding season.

Wildlife associated with aquatic habitats may also be affected by bicycles on trails. Impacts may be indirectly caused by erosion and subsequent sedimentation of streams and vernal pools as a result of poorly designed trails and bicycle travel over bare soils and around drainages. Increased sediment loads can reduce aquatic vegetation and dissolved oxygen concentrations (Sadoway 1986). Sedimentation can directly kill aquatic invertebrates, affecting the success of amphibian larvae and adults (Sadoway 1986). Observations by refuge staff in 2002 document numerous occurrences of amphibian egg masses that failed after becoming coated in sediment from eroding trails and roads nearby. Bartgis and Berdine (1991) report that sedimentation was damaging habitat in Canaan Valley and could cause impacts to rare plants, impair water quality and possibly affect habitat of the southern water shrew (*Sorex palustris punctulatus*), a state species of concern. This was a direct result of vehicle use and road construction prior to the refuge's acquisition of the property. Trail work conducted since 2002 has begun to address sedimentation and erosion issues on refuge trails. Because trails designated for bicycle use are upland areas or locations of existing (compacted) logging roads, the use of bicycles is not expected to significantly increase erosion or sedimentation problems. Through proper trail maintenance and construction, trail drainage would be improved to minimize the effects of erosion and sedimentation on wildlife.

Short-term localized adverse impacts to fish populations also may result from soil erosion and sedimentation into refuge waterways associated with this activity. 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 would 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.

Anticipated impacts of bicycle use on wildlife include temporary disturbances to species using habitats on the trail or directly adjacent to the trail. Bicycle use typically only occurs from spring through fall and usually when the ground is dry. It is restricted to McLaughlin Road, thus impacting only a small area of the refuge. Only a relatively small number of cyclists are believed to be using the road, although on occasional nice days in fall the use may be significant. Use of the roads may cause direct impacts such as mortality (e.g., crushing amphibians) or nest abandonment of bird species nesting on trails. Long-term impacts may include certain wildlife species avoiding trail corridors as a result of this use over time.

The refuge also 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 obtain a SUP.

We would take all appropriate measures to avoid or minimize any negative effects. We would evaluate the road periodically to prevent habitat degradation. If there is evidence of unacceptable adverse impacts on wildlife, we would limit this use as deemed appropriate. We would post and

enforce refuge regulations, and establish, post, and enforce closed areas as needed. Based on the information provided above, this use is not anticipated to significantly increase wildlife habitat fragmentation or cause significant impacts on wildlife through disturbance.

Effects on Threatened and Endangered Species: No impacts are expected on any threatened or endangered species, whether Federal or State listed. No critical habitat has been identified in the vicinity of McLaughlin Road. There has been no indication that bicycling on this road in Sunkhaze Meadows NWR causes problems for wildlife other than minimal and temporary disturbance caused by the mere presence of humans.

Summary: Bicyclists must either drive with bikes on car racks and park at Ash Landing, or ride for many miles on other dirt roads to get to the McLaughlin Road, so current use is light and not expected to dramatically increase. Bicycles going off-trail can cause significant soil erosion and damage to vegetation, but since bicycles would be limited to a flat road designed to support trucks, we do not expect any additional impacts of this kind to occur.

Any effects of bicycling on designated roads and trails are not considered, separately or cumulatively, to constitute significant short-term or long-term impacts. Assessment of potential future impacts was based on available information and current and anticipated level and pattern of use. The current use is viewed as an effective and justifiable method of travel that allows the public to discover, experience, and enjoy priority public uses on the refuge. Monitoring would identify any actions needed to respond to new information (adaptive management) and correct problems that may arise in the future

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Bicycling would be restricted to McLaughlin Road and not allowed on hiking trails or off road.
- Compliance with regulations would be achieved through education, signage and law enforcement which would result in minimizing negative impacts to refuge habitat and wildlife.

- The refuge would be open to this use during regular refuge hours, sunrise to sunset.
- If significant impacts are found, corrective actions (for example, closing the road to this use during mud season) would be taken.

JUSTIFICATION:

While bicycling is not a priority public use of the National Wildlife Refuge System (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997), it is an existing use at Sunkhaze Meadows NWR, with no history of significant negative impacts. The Service and the Refuge System maintain goals of providing opportunities to view wildlife. Allowing the use of McLaughlin Road for bicycling 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.

Allowing bicycling at Sunkhaze NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, bicycling is an historic use of Sunkhaze Meadows NWR. Because this use is restricted to McLaughlin Road, away from sensitive wetland habitats and wildlife and the current and projected 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 National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Bicycling would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species known to occur on the refuge. Therefore, no significant adverse effects from dog walking are anticipated. This activity would not materially interfere with or detract from the mission of the Refuge System because of the limited impacts to refuge resources and the opportunity to reach other users as supporters of the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male Song Sparrows. Animal Behavior 35:773-784.

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Boyle, S.A., and F.B. Samson. 1985. Effects of non-consumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

Burger, J., and M. Gochfeld. 1998. Effects of eco-tourists on bird behavior at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13–21.

Cessford, G. 1995. Off-road impacts of mountain bikes: A review and discussion. Department of Conservation Publication, Wellington, New Zealand. 21 pp.

Ewald, P.W., and F.L. Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31:277-292.

Hammitt, W.E., and D.N. Cole. 1998. Wildlife Recreation: Ecology and Management (2nd edition). New York: John Wiley & Sons. 361 pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin 19:248-257.

Holm, E., and E. J. Crossman. 1986. A report on a 1985 attempt to resurvey areas within the Ontario distribution of Clinostomus elongatus, the redside dace and to summarize previous records. Unpublished report on file Fisheries Branch, Ontario Ministry of Natural Resources and Royal Ontario Museum. 11 pages, 9 tables, 13 figs.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31–39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454–1465.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kuss, F.R. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management 10:638-650.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

——— 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410 (See also corrigendum in Journal of Wildlife Management 54:683).

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89–99.

Sadoway, K.L. 1986. Effects of intensive forest management on amphibians and reptiles of Vancouver Island: problem analysis. Research, B.C. Ministries of Environment and Forests. IWIFR-23. Victoria, British Columbia.

Sweka, J.A., and K.J. Hartman. 2001. Effects of turbidity on prey consumption and growth in brook trout and implications for bioenergetics modeling. Canadian Journal of Fisheries and Aquatic Sciences 58:386-393.

Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: A handbook for trail planners. Colorado State Parks, Denver, Colorado. 51 pp.

Ward, D.H., and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Dog walking on trails

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(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?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

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 X 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 X**

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: Sunkhaze Meadows National Wildlife Refuge

Use: Dog walking on trails

Narrative

Dog walking has been authorized on the refuge for many years. Many people who enjoy walking on the Sunkhaze Meadows National Wildlife Refuge (NWR) trails (including the Sandy Stream and Benton Unit trails) bring their canine companions along with them. Although dogs can increase disturbance to wildlife, the refuge enforces a leash restriction to keep the dog localized and under control at all times with the pedestrian. Limiting dog walking to trails would also keep potential disturbance to a minimum. 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 Sunkhaze Meadows NWR and the priority use of wildlife observation. For these reasons, we have determined that allowing dog 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: Dog walking on trails at all the units of Sunkhaze Meadows NWR

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)), "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

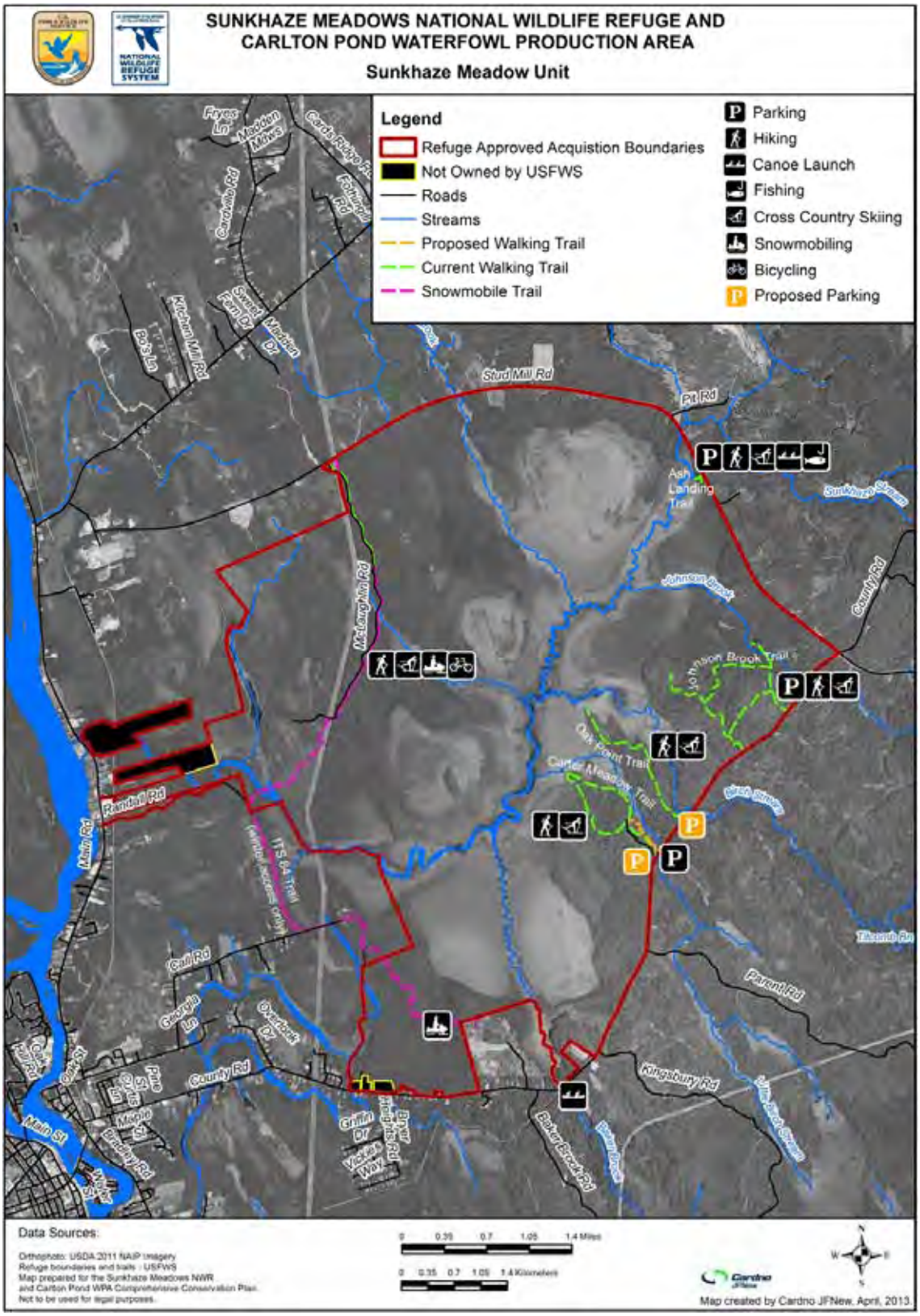
MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

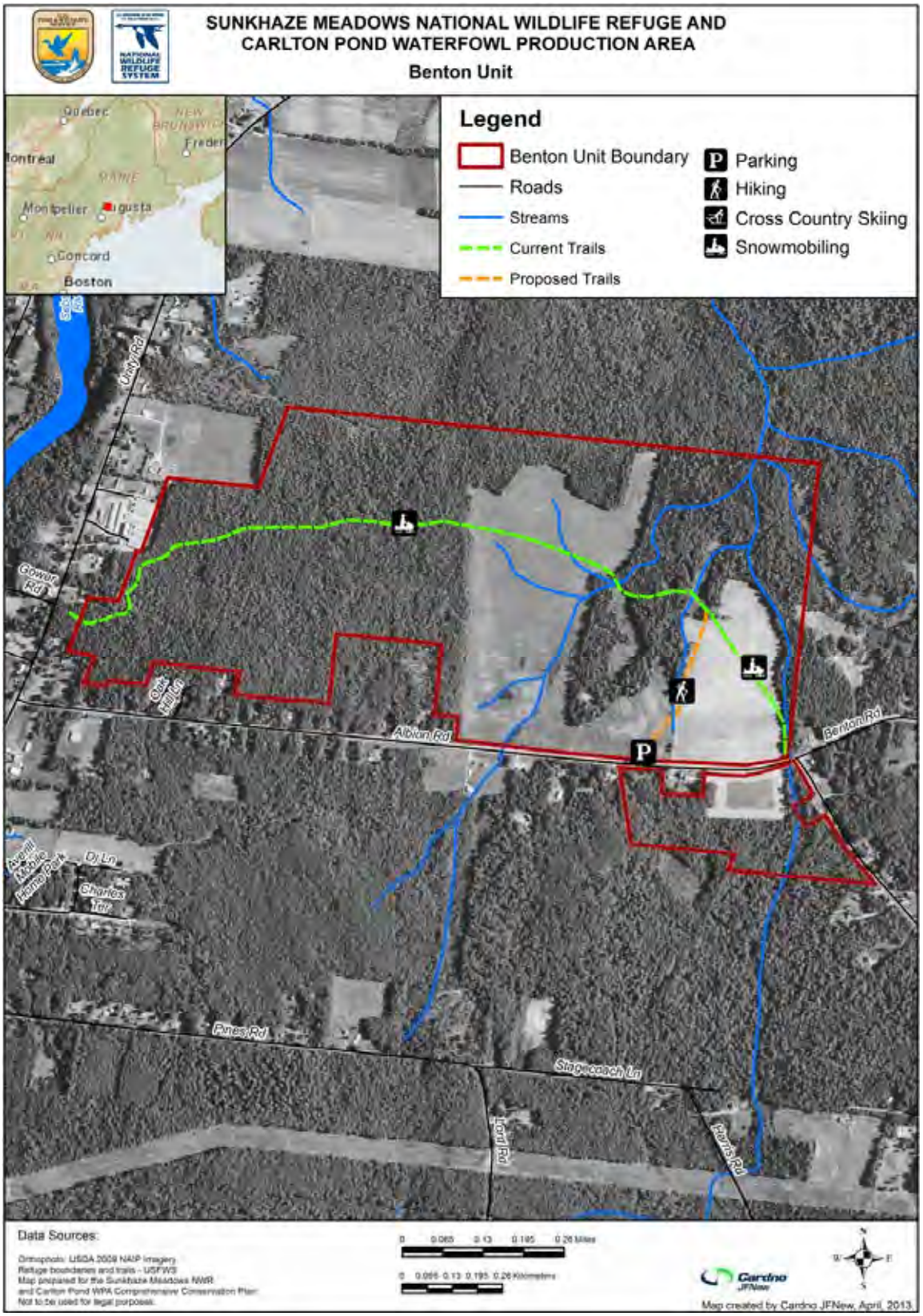
(a) What is the use? Is the use a priority public use?
The use is dog walking. Dog walking is not a priority public use of National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?
Dog walking would be permitted on refuge trails and McLaughlin Road at the Sunkhaze Meadows, Benton, and Sandy Stream Units.

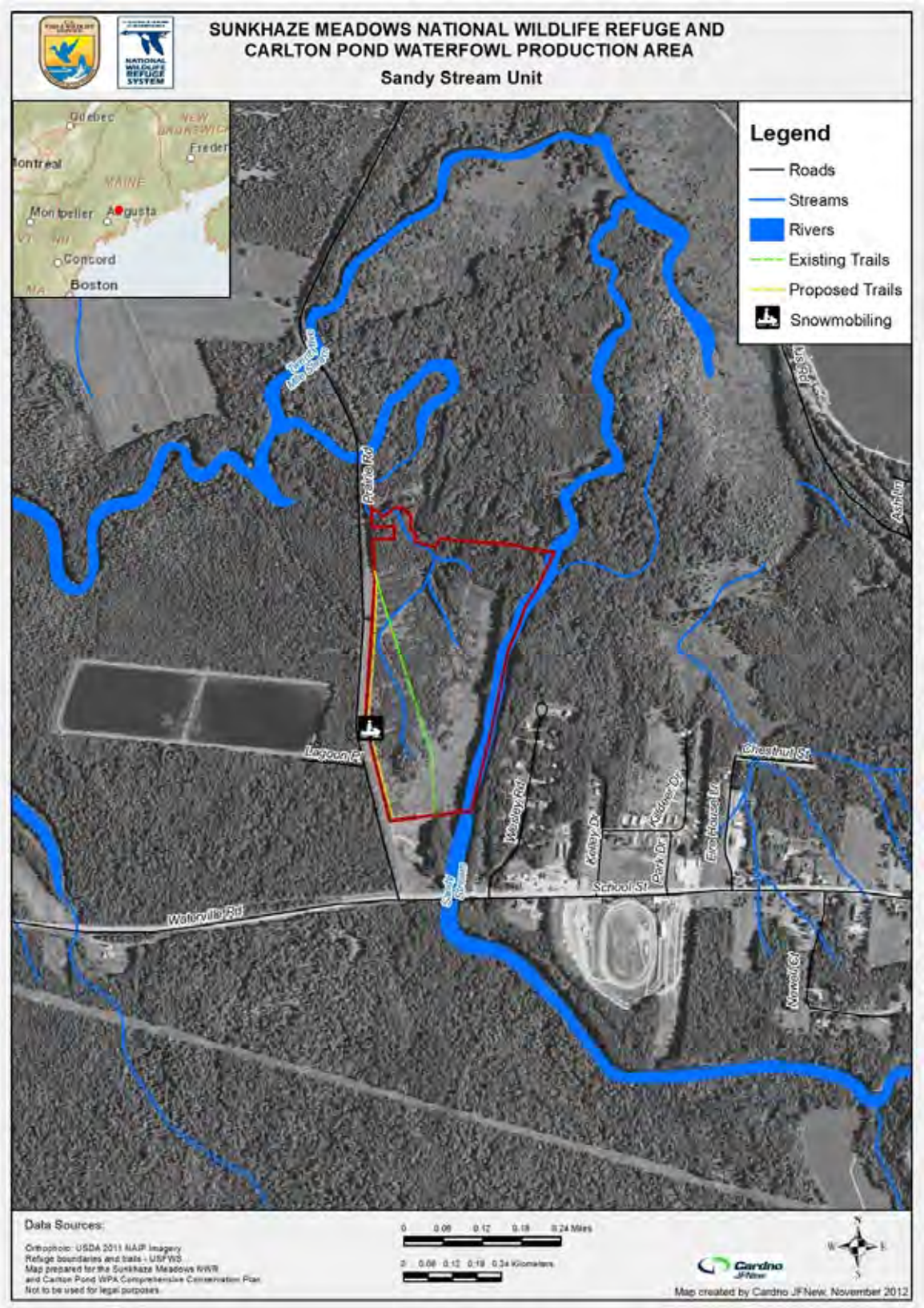
Map B.13. Dog walking is allowed on established roads and trails within the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.14. Dog walking is allowed on established trails within the Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



Map 3.16. Dog walking is allowed on established trails within the Sandy Stream Unit of Sunkhaze Meadows National Wildlife Refuge.



(c) When would the use be conducted?
Dog walking would be allowed throughout the entire year, during the refuge's normal open hours. The refuge is open daily sunrise to sunset.

(d) How would the use be conducted?
Dog walkers would be allowed to walk their dogs only when the dog is attached to a 6-foot (or shorter) leash and the dog walker is in control of the leash and dog at all times. This leash requirement would be enforced to minimize wildlife and visitor disturbance. All dog walkers with properly leashed dogs would be restricted to refuge trails and the McLaughlin Road.

(e) Why is the use being proposed?
This is an ongoing use of the refuge, 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 dog walkers about the refuge and the National Wildlife 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 law is within the regular duties of the Refuge's Law Enforcement 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 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	$1,000
Total:	**$2,000**

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:

The presence of dogs 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 (Gabrielsen 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.

The role of dogs in wildlife diseases is poorly understood. However, dogs can host endo- and ecto-parasites, and can contract diseases from or transmit diseases to wild animals. In addition, dog waste is known to transmit diseases that may threaten the health of some wildlife and other domesticated animals. Domestic dogs potentially can introduce various diseases and transport parasites into wildlife habitats (Sime 1999).

Because the use of the trail system is relatively light, and dog walking would be restricted to public trails 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 6-foot leash will minimize the impacts to other users and wildlife.

We do not anticipate any impacts to water quality, soils, or vegetation other than those impacts from normal trail use as described in our wildlife observation compatibility determination. The use would be confined to existing trails and no new construction or vegetation clearing is required. Impacts on wildlife would be minimal since the trails are not close to wildlife concentration areas and the dogs would be leashed. Short-term disturbance may occur to wildlife directly adjacent to the trail.

User conflicts are unlikely to occur since trails are lightly used and dogs would be on-leash and so prevented from annoying others. Dog waste is unsightly and may carry pathogens, but these impacts may be minimized by encouraging people to pick-up their dog's waste.

Since no federally listed species occur at any of the units of Sunkhaze Meadows NWR, leashed dog walking on the trails would not cause any direct or indirect impacts to federally listed, threatened or endangered species.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Only leashed dogs would be allowed on the refuge. The leash must be no more than 6 feet long. Dog 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.

- Dog walkers must pick up after their dog(s) and remove or properly dispose of pet waste.

- 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 dog-wildlife or dog-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 dog walking from the refuge altogether.

- Restricting dog walking to the trails would reduce the potential disturbance of wildlife.

JUSTIFICATION:

Although dogs can increase disturbance to wildlife, the refuge will strictly enforce a leash law to keep dogs and disturbances localized with the pedestrian. This is an existing use at Sunkhaze Meadows NWR, with no history of significant negative impacts. There are no documented incidents of domestic dog-wildlife disturbances, nor of dog-human conflicts. The majority of dog walkers are likely local residents who regularly visit the refuge for wildlife dependent recreation and who understand our policy. The Service and the Refuge System maintain goals of providing opportunities to view wildlife. Allowing the use of the trail system by persons engaging in dog walking 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.

Allowing dog walking at Sunkhaze NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, dog walking is an historic use of Sunkhaze Meadows NWR. Because this use is restricted to McLaughlin Road and refuge trails, 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 National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Dog walking would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species known to occur on the refuge. Therefore, no significant adverse effects from dog walking are anticipated. This activity would not materially interfere with or detract from the mission of the Refuge System, because of the limited impacts to refuge resources, because it facilitates priority public uses, and because of the stipulations specified above.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Baydack, R.K. 1986. Sharp-tailed grouse response to lek disturbance in the Carberry Sand Hills of Manitoba. Colorado State University, Fort Collins, Colorado.

Gabrielson, G.W., and E.N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 95-107 in R.L. Knight and K.J. Gutzwiller, ed. Wildlife and Recreationists: coexistence through management and research. Island Press, Washington, D.C. 372pp.

Hoopes, E.M. 1993. Relationships between human recreation and piping plover foraging ecology and chick survival. Thesis, University of Massachusetts, Amherst, Massachusetts.

Keller, V. 1991. Effects of human disturbance on eider ducklings *Somateria mollissima* in an estuarine habitat in Scotland. Biological Conservation 58:213-228.

Sime, C.A. 1999. Domestic Dogs in Wildlife Habitats. Pp. 8.1-8.17 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Yalden, P.E., and D. Yalden. 1990. Recreational disturbance of breeding golden plovers (Pluvialis apricarius). Biological Conservation 51:243-262.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Geocaching

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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_X_**

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: Sunkhaze Meadows National Wildlife Refuge

Use: Geocaching

Narrative

Traditional geocaching (by burying, placing, or removing a physical cache) is not allowed on national wildlife refuges, as digging is considered a threat to possible cultural resources and leaving items above ground is considered abandoning property. However, the Friends of Sunkhaze Meadows National Wildlife Refuge have had a non-buried cache on the refuge since 2004 and found it to be an effective tool for attracting a non-traditional audience and introducing them to the refuge. Because of the potential for this use to facilitate priority public uses, such as interpretation and environmental education, we would continue to allow caches on the refuge through the special use permit process. We would enhance the ability of geocaching to facilitate priority public uses by requiring caches on the refuge to offer outreach and interpretation value; the contents of caches would need to be related to the refuge or the refuge's resources in some approved way. In addition, knowing the exact location and "ownership" of each cache would enable us to know it is not abandoned property and keep track of it. It is anticipated that, given the current demand, and with these additional restrictions in place, very few additional caches would be requested. We will limit the number of geocaches if needed.

Allowed in a carefully controlled manner, geocaching is a tool to facilitate priority public uses, and to introduce a different audience to the assets of their National Wildlife Refuge System, and to encourage them to be active in the outdoors. For these reasons, we have determined that geocaching is consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

COMPATIBILITY DETERMINATION

USE: Geocaching

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)), "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1 (Refuge Recreation Act))

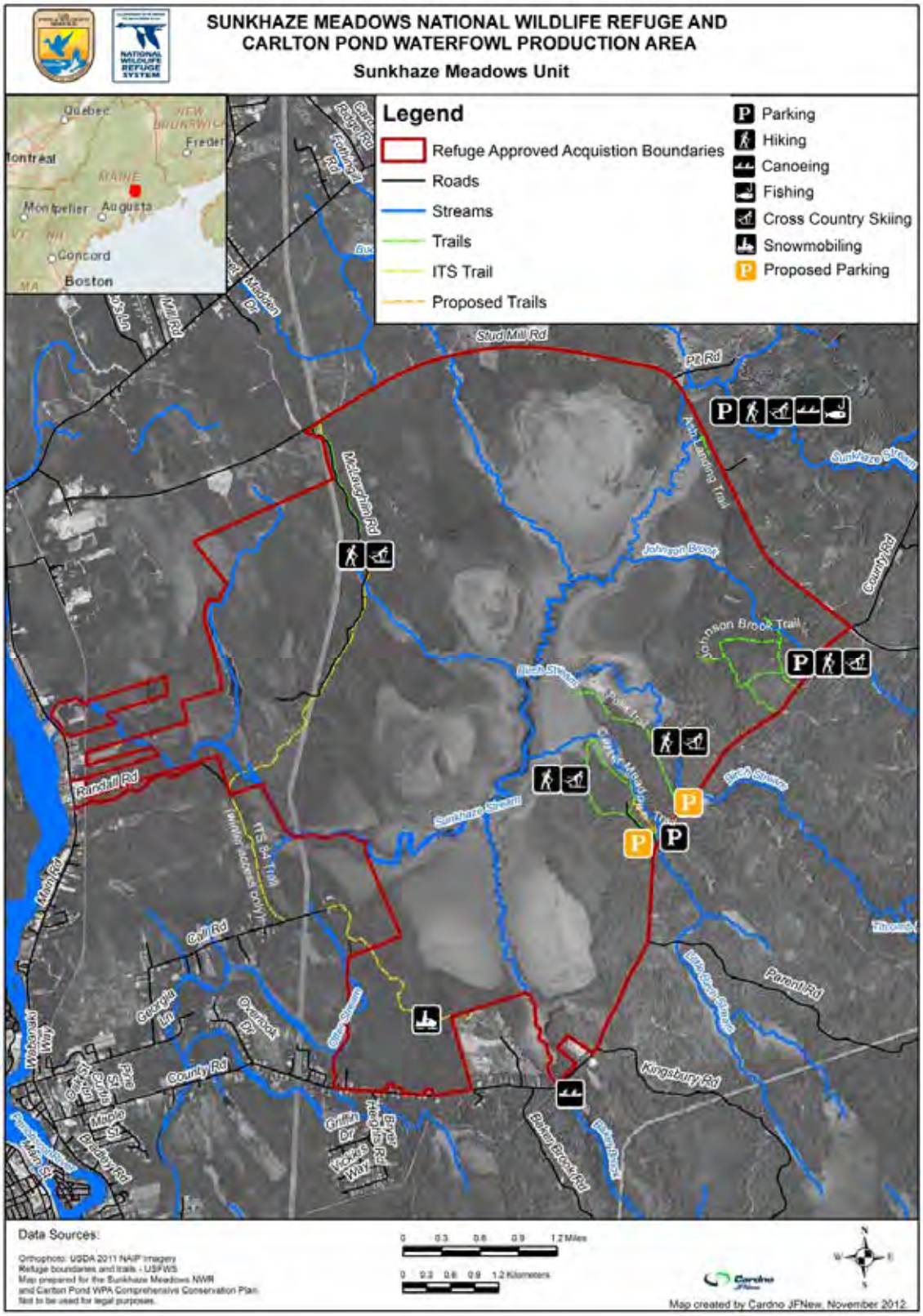
MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

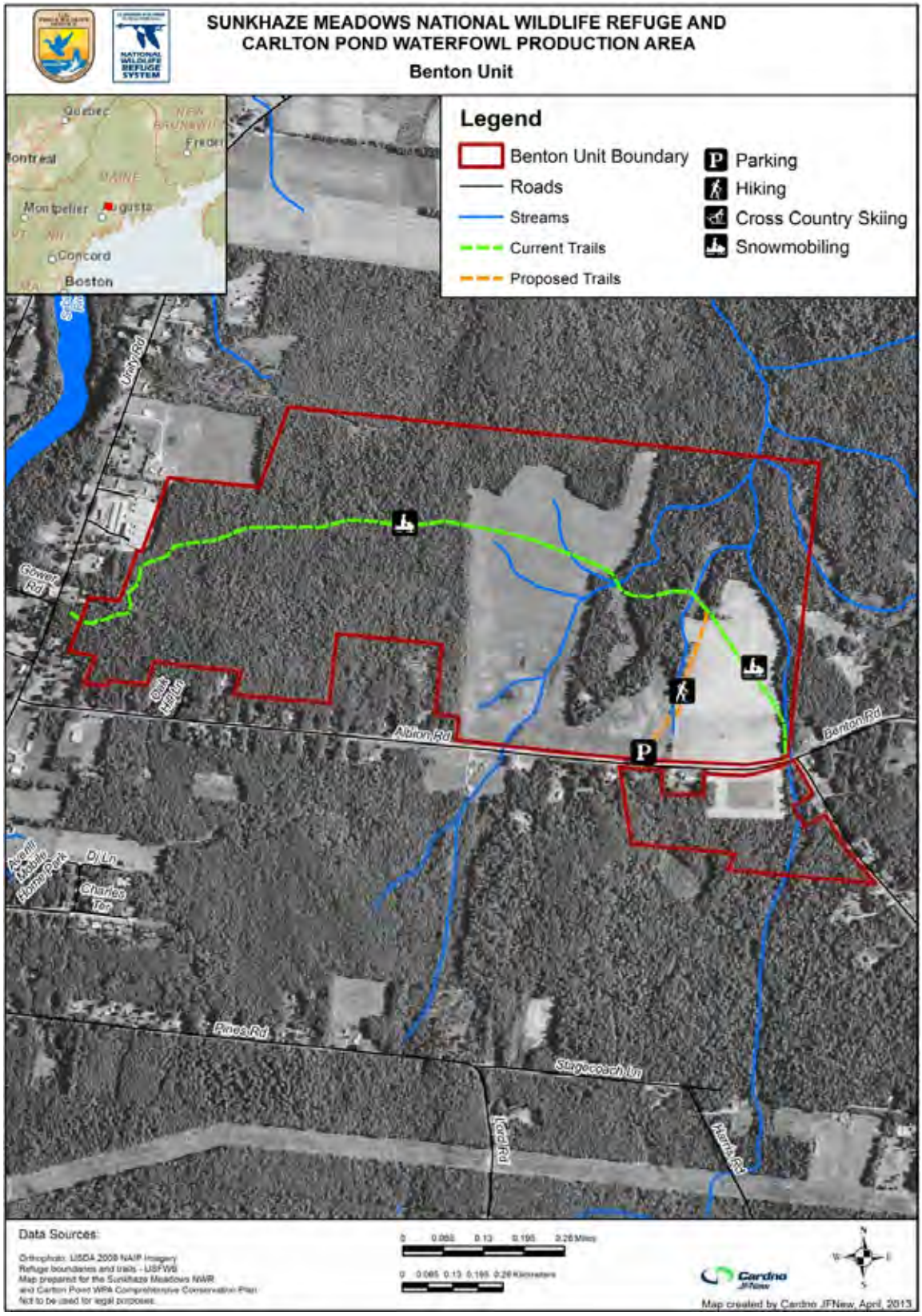
(a) What is the use? Is the use a priority public use?
The use is the placement and finding of non-buried geocaches by interested participants. This use is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?
The location of any geocaches allowed would be at the discretion of the refuge manager on any of the refuge's units, considering factors such as ease of finding, sensitivity of surrounding flora, resilience of path to cache to foot traffic, safety, etc.

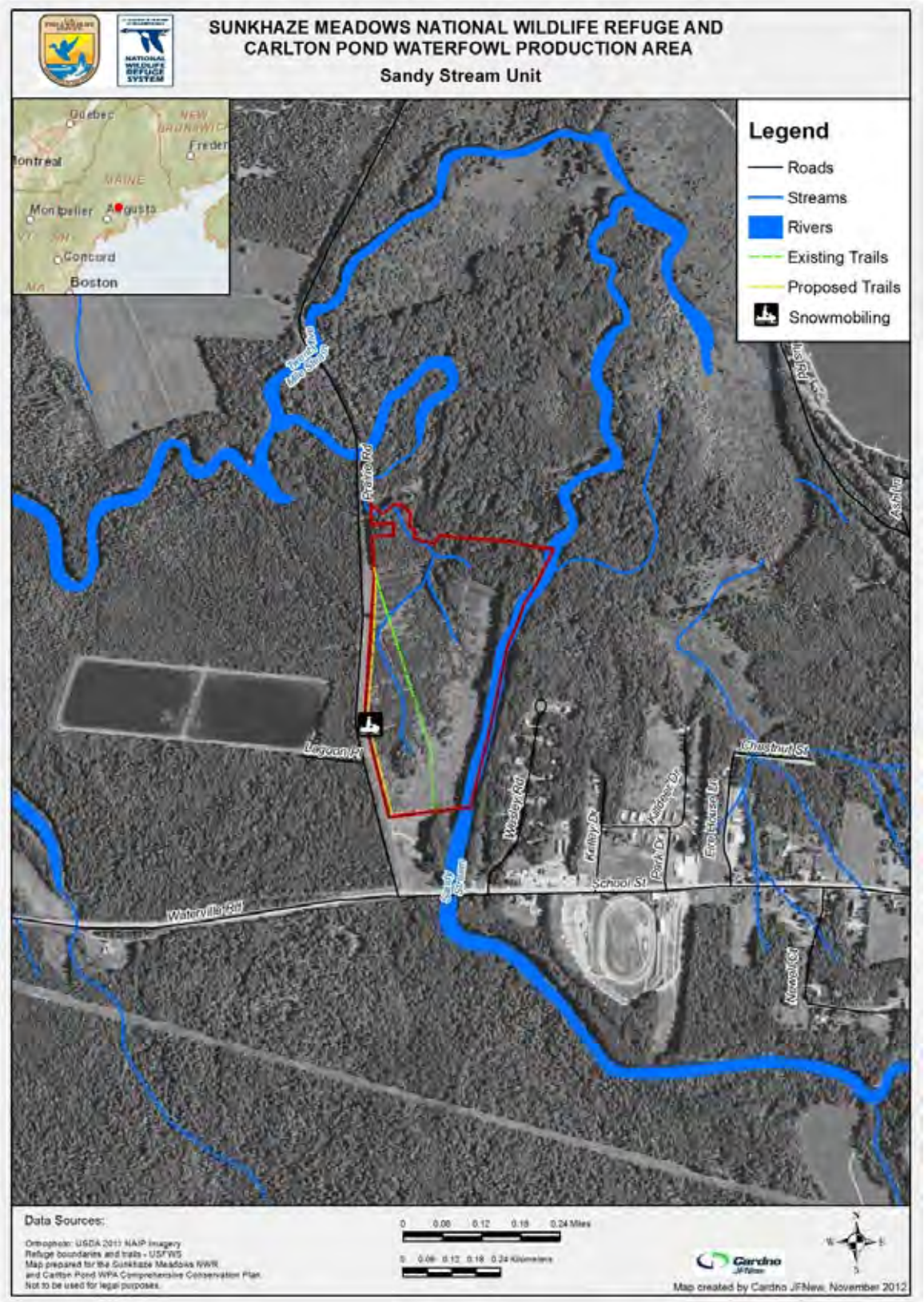
Map B.15. Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.16. Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.17. Sandy Stream Unit of Sunkhaze Meadows National Wildlife Refuge.



(c) When would the use be conducted?
The use would be conducted during daylight hours when the refuge is open to other public uses.

(d) How would the use be conducted?
Traditional geocaching (by burying, placing, or removing of a physical cache) is not allowed on national wildlife refuges, as digging is considered a threat to possible cultural resources and leaving items unknown to the refuge manager above ground is considered abandoning property. In order to remove these objections, burying a geocache would not be allowed, and a special use permit (SUP) would be required for the placement and maintenance of all caches. Knowing the exact location and "ownership" of each cache would allow the refuge manager to know that the cache is not abandoned property and enable us to keep track of it. In addition, caches on the refuge need to offer outreach and interpretation value, so their contents need to be related to the refuge or the refuge's resources in some approved way. It is anticipated that, given the current demand, and with these additional restrictions in place, very few additional caches would be requested. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

(e) Why is this use being proposed?
There is one geocache currently located on the Sunkhaze Meadows NWR. Identified as "For the Love of Peat" on the Web site (*www.goecaching.com)*, this cache was placed by a member of the Friends of Sunkhaze Meadows organization, with permission from a former refuge manager, as a method to encourage visitation to and exploration of the refuge. The Web site shows that 130 visitors have found the cache since it was placed in 2004.

This cache serves the purpose of introducing many geocache enthusiasts, potentially a new audience, to the refuge. Although alternatives to a traditional geocache have been discussed, apparently virtual geocaches do not have the same appeal to enthusiasts as the real thing. In addition, virtual geocaching and other related activities would require the input and oversight of an onsite outreach specialist; we have none as Sunkhaze NWR is currently unstaffed.

AVAILABLITY OF RESOURCES:

Annual costs associated with the administration of geocache SUPs on the refuge are estimated below:

Refuge Biologist (GS11) (review SUP applications, coordinate), 1/2 days/yr:	$168
Administrative Assistant (GS7) (SUP preparation and administration), 1 hr/yr:	$21
Total:	**$189**

The refuge now has, and is anticipated to have into the future, adequate staff and funding to manage this minor use. Staff are currently located offsite at Maine Coastal Island NWR Complex headquarters.

ANTICIPATED IMPACTS OF THE USE:

It is anticipated that any caches that are placed on the refuge would only be allowed to be placed near a parking area or trail. Since hiking, skiing, and snowshoeing are not restricted to trails, geocachers are not being allowed any special privileges. Similar to visitors participating in priority public uses, visitors searching for the cache may create damage to soft surfaces, muddy areas, and thick shrubs or other vegetation, but proper placement of the cache would mitigate these impacts in advance. Disturbance to wildlife near the trail or the off-trail routes to the cache may increase minimally; however, history of the existing geocache at the Sunkhaze Meadows Unit suggests that just over one additional person per month visited the site over the last 8 years. The disturbance of an occasional additional visitor passing through the woods is not significant.

On the positive side, people engaged in geocaching are learning about global positioning systems, getting outdoor exercise, and observing new places. In the case of visiting a geocache at Sunkhaze Meadows NWR, they may be encountering a national wildlife refuge for the first time, and may learn about the Service and the refuge through this encounter, as well as feel more comfortable in the outdoors and see some wildlife as part of their search for the cache.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- All people wishing to place a cache must apply for a SUP, and work with refuge staff to find a good location that works from a caching perspective and also has very low impact to refuge resources. Caches may not be buried. The container used must be durable, waterproof, and unobtrusive.

- The cache must contain information about the refuge or its resources. The contents must be approved by the refuge staff.

JUSTIFICATION:

Traditional geocaching (by burying, placing, or removing a physical cache) is not allowed on national wildlife refuges, as digging is considered a threat to possible cultural resources and

leaving items above ground is considered abandoning property. However, the Friends of Sunkhaze Meadows National Wildlife Refuge have had a non-buried cache on the refuge since 2004 and found it to be an effective tool for attracting a non-traditional audience and introducing them to the refuge. Because of the potential for this use to facilitate priority public uses, such as interpretation and environmental education, we would allow non-buried caches on the refuge through the SUP process. We would enhance the ability of geocaching to facilitate priority public uses by requiring caches on the refuge to offer outreach and interpretation value; the contents of caches would need to be related to the refuge or the refuge's resources in some approved way. In addition, knowing the exact location and "ownership" of each cache would enable us to know it is not abandoned property and keep track of it.

Allowed in a carefully controlled manner (as stipulated above), we expect that the impacts of this use would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System or the purposes for which the refuge was established. Rather, it is a tool to introduce a different audience to the assets of their National Wildlife Refuge System, and to encourage them to be active in the outdoors.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Commercial Guiding for Wildlife-dependent Recreation

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	X	
(c) Is the use consistent with applicable Executive Orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(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?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

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 X 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** X

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: Sunkhaze Meadows National Wildlife Refuge

Use: Commercial Guiding for Wildlife-dependent Recreation

Narrative

Refuge visitors enjoy participating in wildlife-dependent priority public uses, but many may not have the knowledge, skills, or equipment to come to Sunkhaze Meadows National 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 hope 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: Sunkhaze Meadows National Wildlife Refuge

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)), "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." ((16 U.S.C. 460k-1) (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

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) and select activities that have been found compatible and facilitate priority public uses (boating, skiing and snowshoeing, and orienteering). Commercial guiding is the act of accompanying or assisting any person engaged in a wildlife- or nature-dependent public use, in exchange for remuneration for those services.

To date, only a few hunting guides have inquired about obtaining special use permits (SUP), and citizens at comprehensive conservation planning scoping meetings requested that commercial guiding be allowed on Sunkhaze Meadows National Wildlife Refuge (NWR, refuge). Only wildlife- or nature-dependent activities, or those activities already found compatible 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 National Wildlife Refuge System Mission by facilitating priority and/or compatible public uses.

(b) Where would the use be conducted?
These activities take place on all units of the refuge that are open to individual public use. The same areas currently used by non-guided visitors for wildlife observation, wildlife photography, hunting, fishing, and environmental education would likely be used for commercially guided activities. Although the entire refuge is currently open for most activities, and overall use levels are fairly low, if user conflicts arise in the future, commercial activities could be restricted to certain areas or times to minimize such conflicts.

(c) When would the use be conducted?
These activities would take place year-round, subject to the regulations or laws governing the individual public use. Activities would take place during daylight hours only, or specified hunting hours, unless special provision is made with the refuge manager.

(d) How would the use be conducted?
Commercial guides would be allowed to operate on refuge lands through a formal process. 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. SUP applications would be reviewed only when the complete application package has been received. If approved, permits would be mailed within 2 weeks of the request. If not approved, the entire application package (including the 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, 15.41 - 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).

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). 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. Visitors participating in approved

public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, 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?
Because commercial guiding is considered an economic use, per Federal law (see 16 U.S.C. 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 or WPA purposes or the Refuge System mission. We would allow commercial guiding to: (1) better protect refuge lands and waters; and, (2) to facilitate public participation in wildlife-dependent priority public uses, because many visitors may not have the knowledge, skills, confidence, or equipment to come to Sunkhaze Meadows NWR 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 refuge's wildlife and habitats.

AVAILABILITY OF RESOURCES:

Adequate refuge personnel and base operational funds are available to manage guided experiences at existing and projected levels. Administrative staff time would primarily involve issuing and renewing SUPs each year, ensuring licenses and certifications are current, collecting client use-day fees, and reporting data on an annual basis. Fieldwork associated with administering the program primarily involves monitoring the permittees' compliance with permit terms.

Annual costs associated with the administration of commercial guiding on the refuge are estimated below:

Refuge Biologist (GS11) (review applications, coordinate with guides), 2 days/yr:	$ 672
Administrative Assistant (GS7) (SUP preparation and administration), 1 day/yr:	$ 168
Law Enforcement Officer (GS9) (checking activities for permit compliance), 5 days/yr:	$1,200
Total:	**$ 2,040**

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 and other uses that facilitate priority public uses can have positive or negative impacts to the refuge's wildlife and habitats.

The positive impacts of these uses include providing visitors with a better appreciation 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 National Wildlife Refuge System, and the Service, as well as wildlife conservation in general.

The negative effects of these uses include impacts to plants, soils, hydrology, and wildlife from both visitors participating in the six priority public uses, boating, and skiing and snowshoeing on the refuge. The impacts associated with these activities are discussed in detail under the respective CDs. Below is a summary of potential impacts associated with pedestrian and boating and a discussion of additional impacts that could be associated with commercial guiding.

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). Peatlands are particularly vulnerable to damage by visitors who may walk through them or collect plants. At Sunkhaze Meadows NWR, the peatlands are difficult to access due to the large area of wetlands that exist between the streams and the peat domes; there are no designated trails to access these sensitive areas. Plant collecting is also prohibited. 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.

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.

Boating is not expected to have adverse impacts on refuge vegetation boat access sites and trails are located away from sensitive wetlands, peatlands, and rare plants. 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, therefore we do not anticipate any significant effects on refuge vegetation from boaters.

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. Under current levels of use, impacts to soils (erosion, compaction) are not likely to be significant.

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, 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.

Since all the units of the refuge are fairly flat, erosion is not a large problem, but impacts to wet areas can occur when bridging is inadequate and visitors widen or go off the trail to avoid wet spots. Properly sited, designed, and maintained trails minimize this impact. Based on the current level 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.

Negative impacts on water quality from motorboat and other pollutants, human waste, and litter: Extensive water quality testing on Sunkhaze Stream and its tributaries has not been carried out. The levels of pollutants from boat fuel and impacts on local aquatic systems are unknown. Hydrocarbon contamination can be harmful to fish. Currently most boating 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 Knight1998), 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. 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. The most commonly observed wildlife in the winter is deer, snowshoe hare, chickadees, nuthatches, and ravens.

Summary of Impacts:

Opening the refuge to commercial guiding could increase the number of visitors to the refuge and increase the number of larger groups (4 or more people) visiting the refuge. Based on observations, few known requests to commercially guide on the refuge, and knowledge of the areas involved, there is no evidence that cumulatively, commercial guiding would have a noticeable increase in adverse effects on the refuge resources. 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 additional stipulations below and would be routinely checked by the refuge law enforcement officer for compliance with regulations and permit conditions. Permit conditions and stipulations noted below 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 comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The following stipulations apply to SUPs issued for commercially guided recreational tours. 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.

- Per Maine State law, any person who receives any form of remuneration for his/her services in accompanying or assisting any person in the fields, forests, or on the waters or ice within the boundaries of the State of Maine while hunting, fishing, trapping, boating, snowmobiling, or camping at a primitive camping area must be in possession of the appropriate, valid Guide's license issued by the State. Camping is not an authorized public use of the refuge, and is not allowed.

- The permittee would not advertise on refuge property; leaflets may not be distributed via the Refuge Visitor Center, Headquarters, etc. Leaflets may be

distributed only during approved programs covered by the SUP and only to those participants registered for that program.

- 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 Red Cross First Aid and CPR certification for all guides.

- The refuge needs public use figures for end-of-year reports (both fiscal year and calendar year); therefore, SUP use figures must be turned in to the refuge by August 1st with estimates through September 30th, 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, (2) any stipulations in the compatibility determinations for applicable authorized public uses, or (3) any Federal, State, local, or refuge regulations may result in a Notice of Violation (NOV) 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 had 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 relevant refuge information, including regulations and conditions of permit. The U.S. Fish and Wildlife Service would supply information to permittee, on request.

- Vehicle(s) would be used only on designated roadways and in parking areas.

- Tours must begin and end during daylight hours only unless commercially guiding for hunting where refuge hunting hours apply.

- Groups would police their clients for litter, vandalism, etc. and report any problems to the refuge office.

- Individuals guiding bird watching clients or tours may not use electronic calls without the express written permission of the refuge manager.

JUSTIFICATION:

We have determined that allowing commercial guiding at Sunkhaze Meadows National Wildlife Refuge would not materially interfere with, or detract from, the mission of the National Wildlife 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 National Wildlife Refuge System or the purposes for which the refuge was established as follows. First, refuge visitors enjoy participating in wildlife-dependent priority public uses, but many may not have the knowledge, skills, or equipment to come to Sunkhaze Meadows NWR and engage in these activities. Commercial guides may 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. Second, by allowing this activity, refuge staff hope 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 National Wildlife Refuge System. In addition, this use also helps fulfill goal 4 of the CCP, "Promote enjoyment and environmental stewardship by engaging visitors, students, and nearby residents to experience the wetlands, woods, and wildlife at Sunkhaze Meadows Unit."

SIGNATURE: Refuge Manager: _____

(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male song sparrows. Animal Behavior 35:773-784.

Batten, L.A. 1977. Sailing on reservoirs and its effects on water birds. Biological Conservation 11:49-58.

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36-41.

Boyle, S.A., and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation.

Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123-130.

Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. Journal of Comparative Physiological Psychology 95:676-684.

——— 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. Environmental Conservation 22:56-65.

Butler, J.R. 1984. The myths, the reality, and the challenges of managing for the non-consumptive wildlife user. *In* W.C. McComb, editor and compiler. Proceedings of the Workshop on Management of Nongame Species and Ecological Communities. University of Kentucky, Department of Forestry, Lexington, Kentucky. 404 pp.

Cairns, W.E., and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. American Birds 34: 206-208.

Carlson, L.H., and P.J. Godfrey. 1989. Human impact management in a coastal recreation and natural area. Biological Conservation.

Cassirer, E.F., D.J. Freddy, and E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. *In:* Hendee, J.C., G.H. Stankey, R.C. Lucas. eds., Wilderness Management.

Cole, D.N., and P.B. Landres. 1995. Indirect effect of recreation on wildlife in Knight, R.L, and K.J. Gutzwiller, eds. 1995. Wildlife and Recreationists—Coexistence Through Management and Research. Washington, D.C. Island Press.

Dearden, P., and C. Hall. 1983. Non-consumptive recreation pressures and the case of the Vancouver Island marmot (*Marmota vancouverensis*). Environmental Conservation. Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation 18:39-51.

Ewald, P.W., and F.L Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31:277-292.

Ferguson, M.A.D., and L.B. Keith. 1982. Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. Canadian Field-Naturalist.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and in snowmobiles. Wildlife Society Bulletin 14:63-68.

Goff, G.R., D.J. Decker, G. Pomerantz. 1988. A diagnostic tool for analyzing visitor impacts on wildlife refuges: a basis for a systematic approach to visitor management. Transactions of the Northeast Section of the Wildlife Society.

Goodrich, J.M., and J. Berger. 1994. Winter recreation and hibernating black bears *Ursus americanus*. Biological Conservation. Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of human intrusion on son occurrence and singing consistence in subalpine birds. The Auk 111(1):28-37.

Hall, D., and P. Dearden. 1984. The impact of non-consumptive recreation on wildlife: an annotated bibliography.

Hammitt, W.E., and D.N. Cole. 1998. Wildland Recreation. John Wiley & Sons, New York, 361 pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin 19:248-257.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Klein, M.L. 1989. Effects of high levels of Human Visitation on Foraging Waterbirds at J.N. "Ding" Darling NWR, Sanibel, Florida. Final Report to USFWS. 103 pp.

——— 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454-1465.

Knight, R.L., and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. *In:* Glinski, R.L., B.G. Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, S.W. Hoffman, C.E. Ruibal, D.L. Krahe, D.L. Owenseds. Proceedings of the southwest raptor management symposium and workshop.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Trans. 56th National Association of Wildlife and Natural Resources Conference. Pp. 238-247.

——— 1995. Wildlife responses to recreationists. Pp. 51-69 in: Knight, R.L. and K.J. Gutzwiller eds., Wildlife and recreationalists: coexistence through management and research. Island Press, Washington, D.C. 372 pp.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kuss, F.R., and A.R. Graefe. 1985. Effects of recreation trampling on natural area vegetation. Journal of Leisure Research.

Kuss. F. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management. 10:638-650.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pp. 249-297 in: A. Sprunt IV, J.C. Ogden, and S. Winckler, eds., Wading Birds. National Audubon Society, New York, New York.

Marion, J.L., and D.W. Lime. 1986. Recreational resource impacts: visitor perceptions and management responses. In: Kulhavy, D.L. and R.N. Conner eds., Wilderness and natural areas in the Eastern United States: a management challenge.

McNeil, R., P. Drapeau, and J.D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. Biological Review 67:381-419.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

——— 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.

More, T.A. 1979. The demand for nonconsumptive wildlife uses: a review of the literature.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53: 401-410 (also see corrigendum in Journal of Wildlife Management 54:683).

Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, and N.A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges. Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130

Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

——— 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: a handbook for trail planners. Colorado State Parks, Denver, CO. 51pp.

U.S. Fish and Wildlife Service (USFWS). 1985. Refuge Manual. U.S. Government Printing Office, Washington, DC.

——— 1988. Final environmental assessment, proposal to establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge preliminary station management plan.

——— 1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

Van der Zande, A.N., J.C. Berkhuizen, H.C. Van Latesteijn, W.J. Ter Keurs, A.J. Poppelaars. 1984. Impact of outdoor recreation on the density of a number of breeding bird species in woods adjacent to urban residential areas. Biological Conservation.

Vaske, J.J., A.R. Graefe, and F.R. Kuss. 1983. Recreation impacts: a synthesis of ecological and social research. Transactions of the North American Wildlife and Natural Resource Conference 48:96-107.

Ward, D.H., and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Commercial Haying

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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 X 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** X

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: Sunkhaze Meadows National Wildlife Refuge

Use: Commercial Haying

Narrative

Commercial haying at Sunkhaze Meadows National Wildlife Refuge (NWR, refuge) would be permitted in designated grassland management areas of the refuge. The configuration of the areas and the number of acres managed by haying may change from year to year. These areas are currently:

Benton Unit: 72 acres

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. Haying removes vegetation from the field which is otherwise left by brush hog mowing equipment. This rank cut vegetation builds a duff layer in the "understory" of the grassland which, over time, can make the grassland less suitable for target grassland-nesting bird species. Periodic removal of the vegetation from the field helps reduce dense duff layer development, and can be beneficial for nesting grassland bird species such as bobolinks and grasshopper sparrows. Unlike nearby haying on commercial farmland, haying on the refuge is 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 this way, haying contributes to goal 3 of the Sunkhaze Meadows NWR and Carlton Pond WPA Draft Comprehensive Conservation Plan (CCP) and Environmental Assessment, which states that the refuge will provide and promote through active management a diversity of successional habitats, including grasslands, to sustain early successional and shrubland 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 cutting 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 National Wildlife 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: Haying to Manage Grassland Habitat

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 (Refuge Recreation Act)

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is haying to manage grassland habitat. Haying is a refuge management economic activity, not a priority public use of the National Wildlife 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 72 acres of grass fields within the 334-acre Benton Division of the Sunkhaze Meadows National Wildlife Refuge (NWR, refuge). This represents 21 percent of the Benton Division's acreage and 0.6 percent of the total refuge acreage. A map of the acreage to be hayed during a given year would be appended to the annual special use permit which is issued for this use.

(c) When would the use be conducted?
Refuge permittees would be able to access refuge hay fields from April through October, 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 15th each year, to ensure that grassland bird species have completed nesting. Harvesting and equipment removal must be completed by October 31st, which is the ending date of the annual SUP issued for this refuge use.

(d) How would the use be conducted?
Individuals would be authorized to cut hay via a special use permit (SUP) issued by the refuge manager. Refuge grasslands and open fields are currently mowed or hayed every 1 to 3 years depending on weather and field conditions, desirability of the hay by local farmers, and refuge wildlife and habitat management goals. Haying frequency and intensity would be determined by what is needed to suppress broadleaf and woody plant invasion and to develop a mosaic of grassland vegetation in fields where open grassland is desired. Acres hayed 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.

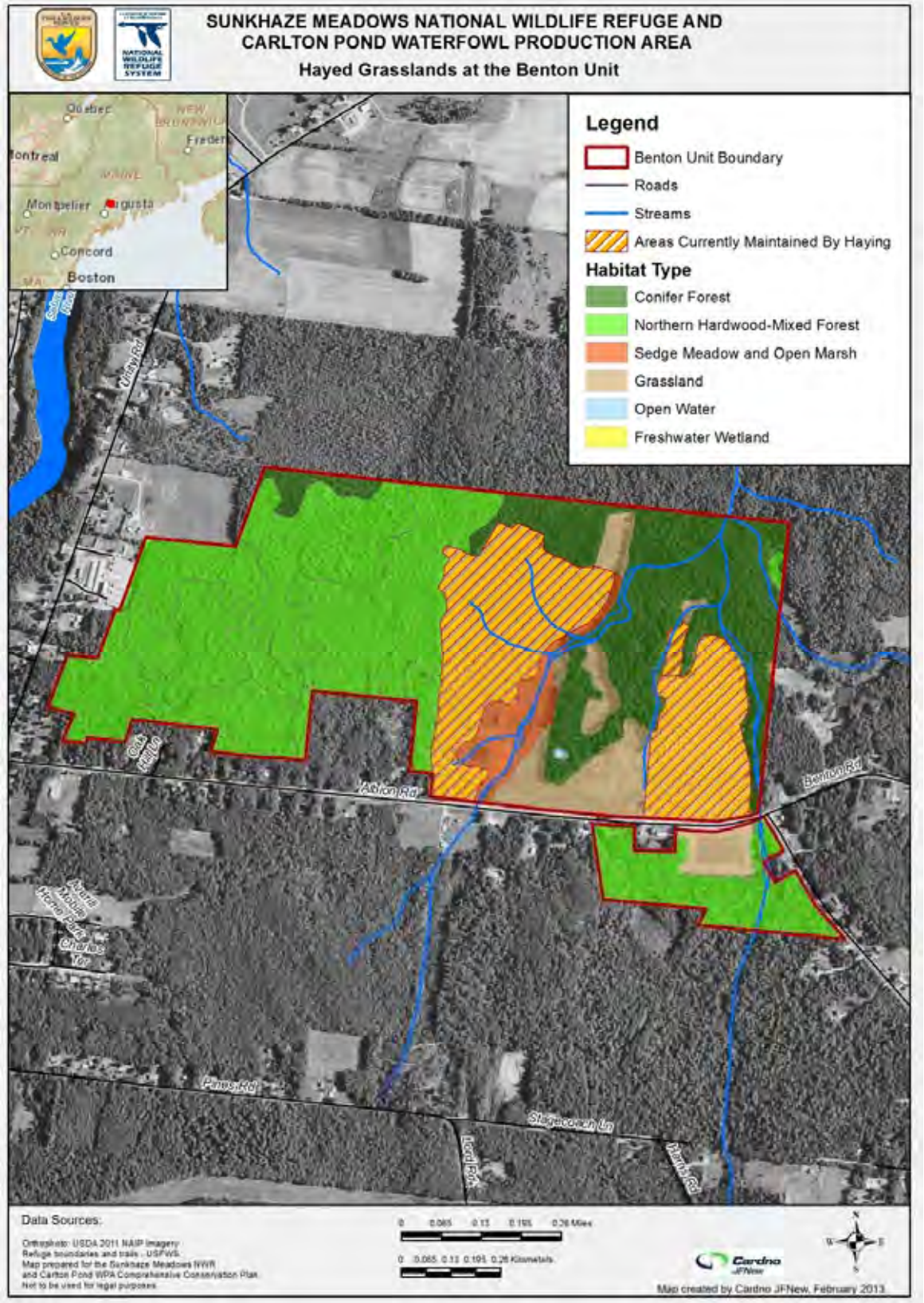
All activities under this SUP process are regulated by provisions listed in 50 CFR, subpart D - Permits, 15.41 - 45. The permittee would be required to comply with all Department of the Interior, U.S. Fish and Wildlife Service, and Federal, State, and local laws in the conduct of their business. Because 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 SUP.

When the refuge haying program was established, an initial fee of $10 per acre was determined through a survey conducted by the local office of the Farm Services Agency. This survey revealed that the average farmer in the Benton, Maine area who leased land for haying paid $10 per acre. The $10 rate has been increased in subsequent years to match the annual cost-of-living increases given to the recipients of Social Security checks. Since 2007, the haying permittee has been required to pay an annual fee of $12.66 per acre.

All 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.

Grass seed to be used would consist of species native to central Maine and may not contain any genetically modified materials, as specified by Service policy. Soil amendments may include some portion of Class A sludge (AD + compost), but no Class B sludge may be used. 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.

Map B.18. Commercially hayed grasslands at the Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



Administration of the haying program would be conducted in accordance with the refuge Habitat Management Plan (USFWS 2007). 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.

(e) Why is this use being proposed?

Sunkhaze Meadows NWR was established to benefit migratory birds. Goal 3 of the Sunkhaze Meadows NWR and Carlton Pond WPA Draft Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) states that the refuge will provide and promote through active management a diversity of successional habitats, including grasslands, to sustain early successional and shrubland species.

We would maintain 95 acres of grassland at the Benton Division of grassland to provide nesting and migratory habitat for landbirds of high conservation priority in PIF Area 27 such as bobolinks, sedge wrens, and American woodcock. Haying is one method we would use to maintain this habitat.

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 is generally 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), and eastern meadowlark (Lanyon 1995, Hull 2000). All of these species use the Benton Division of Sunkhaze Meadows NWR, at least during migration.

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 a combination of mowing and burning 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 (Laura Mitchell, personal communication). Without active management, refuge grasslands could quickly become dominated by 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:	$1,000 GS-9 Refuge Officer
Resource impacts/monitoring:	$1,000 GS-11 Wildlife Biologist
Total:	**$2,000**

ANTICIPATED IMPACTS OF THE USE:

Effects on Wildlife:

Haying on the Benton Division of Sunkhaze Meadows NWR 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 is not a significant impact. The resulting habitat would improve conditions for most of the species adversely affected by the short-term negative impacts (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 Benton Division, are used by woodcock as nocturnal roosting areas during the summer months. The American woodcock is a high priority species under both the Partners in Flight and Bird Conservation Region 14 programs.

The lush re-growth that appears after a field is hayed provides green browse for Canada geese, 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 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. 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 no exposed mud in the fields to get stuck in the tires and because the invasive plants that are most problematic in the area -primarily thistles- are spread via wind-blown seeds. 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. Furthermore, haying, in conjunction with a 5-year prescribed burn program for areas that are too wet or rocky for haying, would help to develop a mosaic of grassland vegetation. 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 ammendments (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 comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

On refuge lands:

- 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 October, as needed for the haying operation for the purposes of soil testing, and crop monitoring. Tractor access for the application of soil amendments, planting, and harvesting, is restricted to after July 15.

- To minimize risk of spreading invasive species, haying equipment (e.g., harvesters or mowers) must be cleaned prior to entering Service lands. Cleaning entails removal of visible soil and plants or plant parts.

- The results of soil tests will be submitted to the refuge manager, along with planned rates of amendment (fertilizer) application, for review a week prior to planned application. The refuge manager reserves the right to approve or disapprove the planned application.

- 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). To provide enough time for us to complete the Service's pesticide 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 rate, 2) recommended number of applications, 3) application methods and, 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.

- 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 October 31, 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.

- Permittees must abide by the conditions stated in the annual SUP.

JUSTIFICATION:

We have determined that allowing commercial guiding on Sunkhaze Meadows National Wildlife Refuge would not materially interfere with, or detract from, the mission of the National Wildlife 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 National Wildlife Refuge System or 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 ground-nesting migratory birds. 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. If equipment and staff were available, haying would be conducted by refuge staff and therefore, not be subject to a

compatibility determination. However, it is more efficient and cost effective to issue an annual SUP to harvest hay.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Askins, R.A. 1993. Population trends in grassland, shrubland, and forest birds in Eastern North America, p. 1-34. Pages 1-34 *in:* D. M. Power ed., Current ornithology, vol. 11. Plenum Pree, New York.

——— 1997. History of grasslands in the northeastern United States: implications for conservation. Pages 119-136 *in:* P.D. Vickery and P.W. Dunwiddie, eds., Grasslands of northeastern North America, ecology and conservation of native and agricultural landscapes. Massachusetts Audubon Society, Lincoln, Massachusetts, USA.

Atkeson, T.Z., and Givens, L.S. 1953. The use of hay crops in southeastern waterfowl management. Journal of Wildlife Management.

Baker, J.A., and R.J. Brooks. 1981. Raptor and vole populations at an airport. Journal of Wildlife Management.

Berkey, G., R. Crawford, S. Galipeau, D. Johnson, D. Lambeth, and R. Kreil. 1993. A review of wildlife management practices in North Dakota: effects on nongame bird populations and habitats. Report submitted to Region 6, U.S. Fish and Wildlife Service, Denver, Colorado.

Bollinger, E.K., P.B. Bollinger, and T.A. Gavin. 1990. Effects of hay-cropping on eastern populations of the bobolink. Wildlife Society Bulletin.

Bollinger, E.K., and Gavin, T.A. 1992. Eastern bobolink populations: ecology and conservation in an agricultural landscape. *In:* Hagan, J.M., D.W. Johnston, eds., Ecology and conservation of neotropical migrant landbirds.

Dechant, J.A., M.F. Dinkins, D.H. Johnson, L.D. Igl, C.M. Goldade, B.D. Parkin, and B.R. Euliss. 2001a. Effects of management practices on grassland birds: upland sandpiper.

Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page. *http://www.npwrc.usgs.gov/resource/literatr/grasbird/upsa/upsa.htm* (Accessed February 2000).

——— 2001b. Effects of management practices on grassland birds: northern harrier. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page. *http://www.npwrc.usgs.gov/resource/literatr/grasbird/ harrier/harrier.htm* (Accessed February 2000).

——— 2001c. Effects of management practices on grassland birds: grasshopper sparrow. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page. *http://www.npwrc.usgs.gov/resource/literatr/grasbird/ grasshop/grasshop.htm* (February 2000).

——— 2001d. Effects of management practices on grassland birds: bobolink. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page. *http://www.npwrc.usgs.gov/resource/literatr/grasbird/bobo/ bobo.htm* (Accessed February 2000).

George, R.R., A.L. Farris, C.C. Schwartz, D.D. Humburg, J.C. Coffey. 1979. Native prairie grass pastures as nest cover for upland birds. Wildlife Society Bulletin.

Herkert, J.R, R.E. Szafoni, V.M. Kleen, and J.E. Schwegman. 1993. Habitat establishment, enhancement and management for forest and grassland birds in Illinois. Natural Heritage Technical publication #1, Illinois Department of Conservation, pp. 1–20. Northern Prairie Wildlife Research Center Online. *http://www.npwrc.usgs.gov/resource/birds/manbook/index.htm* (Accessed December 2012)

Hirst, S.M., and C.A. Easthope. 1981. Use of agricultural lands by waterfowl in southwestern British Columbia. Journal Wildlife Management.

Hull, S.D. 2000. Effects of management practices on grassland birds: eastern meadowlark. Northern Prairie Wildlife Research Center, Jamestown, North Dakota.

Hurley, R.J., and E.C. Franks. 1976. Changes in the breeding ranges of two grassland birds. Auk.

Jarvis, R.L. and S.W. Harris. 1971. Land-use patterns and duck production at Malheur National Wildlife Refuge. Journal of Wildlife Management. 1971.

Jones, A.L. and P.D. Vickery. 1997. Conserving grassland birds. Massachusetts Audubon Society, Lincoln, Massachusetts.

Kelley, J.R., Jr. 2003. American woodcock population status. 2003. U.S. Fish and Wildlife Service, Laurel, Maryland.

Kirby, R.E., J.K. Ringelman, D.R. Anderson, R.S. Sojda. 1992. Grazing on national wildlife refuges: do the needs outweigh the problems? Transactions of the 57th North American Wildlife and Natural Resources Conference. Wildlife Management Institute, Washington, DC.

Kisch, L.M. and K.F. Higgins. 1976. Upland sandpiper nesting and management in North Dakota. Wildlife Society Bulletin 4:16-20

Knopf, F.L. 1995. Declining grassland birds. Pages 296-298 *in:* E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. U.S. National Biological Service, Washington, DC.

Kotler, B.P., M.S. Gaines, B.J. Danielson. 1988. The effects of vegetative cover on the community structure of prairie rodents. Acta Theriologica.

Labisky, R.F. 1957. Relation of hay harvesting system to duck nesting under a refuge-permittee system. Journal Wildlife Management.

Lanyon, W.E. 1995. Eastern meadowlark (*Sturnella magna*). *In:* A. Poole and F. Gill, eds., The Birds of North America. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists Union, Washington, DC.

Mitchell, L.R., C.R. Smith, and R.A. Malecki. 2000. Ecology of grassland breeding birds in the Northeastern United States - a literature review with recommendations for management. U.S. Geological Survey, Biological Resources Division and New York Cooperative Fish and Wildlife Research Unit, Department of Natural Resources, Cornell University, Ithaca, New York.

Moen, A.N. 1983. Agriculture and wildlife management.

Murphy, R.K. 1993. History, nesting biology, and predation ecology of raptors in the Missouri Coteau of northwestern North Dakota.

New York State Department of Environmental Conservation. 1997. Endangered, threatened and special concern fish and wildlife species of New York State. New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, New York.

Norment, C. 2002. On grassland bird conservation in the Northeast. The Auk 119:271-279.

Pashley, D.N., C.J. Beardmore, J.A. Fitzgerald, R.P. Ford, W.C. Hunter, M.S. Morrison, K.V. Rosenberg. 2000. Partners In Flight: conservation of the landbirds of the United States. American Bird Conservancy, The Plains, Virginia.

Robbins, C.S., D. Bystrak and P.H. Geissler. 1986. The breeding bird survey: its first fifteen years, 1965-1979. U.S. Fish and Wildlife Service Resource Publishing 157.

Sauer, J.R., J.E. Hines, G. Gough, I. Thomas, and B.J. Peterjohn. 1997. The North American breeding bird survey results and analysis. Version 96.4. Patuxent Wildlife Research Center, Laurel, Maryland. Accessed December 1999 at: *http://www.mbr-pwrc.usgs.gov/bbs/bbs.html.*

Sepik, G.F., R.B. Owen, Jr., M.W. Coulter. 1981. Reprinted 1992. A landowners guide to woodcock management in the Northeast. Maine Agricultural Experiment Station, University of Maine. Miscellaneous Report 253. pp 7-12.

Strassman, B.I. 1987. Effects of cattle grazing and haying on wildlife conservation at National Wildlife Refuges in the USA. Environmental Management.

Swanson, D.A. 2001. Effects of management practices on grassland birds: savannah sparrow. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page. Accessed February 2000 at: *http://www.npwrc.usgs.gov/resource/literatr/grasbird/savannah/savannah.htm*.

Vickery, P.D. 1996. Grasshopper Sparrow (*Ammodramus savannarum*). *In:* A. Poole and F. Gill, eds., The Birds of North America, No. 239. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

U.S. North American Bird Conservation Initiative Committee. 2000. North American Bird Conservation Initiative; bringing it all together. U.S. Fish and Wildlife Service, Arlington, Virginia.

U.S. Fish and Wildlife Service (USFWS). 1982. Refuge Manual: 6 RM 5.6C. Division of Refuges, Arlington, Virginia.

——— 1985. Refuge Manual. Washington, DC. U.S. Government Printing Office. 5RM17, 6RM5, 6RM9.

——— 1988. Final environmental assessment, proposal to establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge preliminary station management plan.

——— 1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

——— 2002. Birds of conservation concern 2002. Division of Migratory Bird Management, Arlington, Virginia.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

Young, L.S. 1989. Effects of agriculture on raptors in the Western United States: an overview. National Wildlife Federal Science Technology Service.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Orienteering

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(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?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

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 _X_ 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 __X___**

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: Sunkhaze Meadows National Wildlife Refuge

Use: Orienteering

Narrative

On occasion, small groups (20 or less), like a Boy Scout troop, may wish to use Sunkhaze Meadows National Wildlife Refuge (refuge) as an outdoor classroom to teach participants how to navigate through the woods by map and compass. We would allow this use only for educational, and not competitive, purposes under carefully regulated conditions outlined in a special use permit. This use would introduce a different audience to the assets of the National Wildlife Refuge System, encourage them to be active in the outdoors, and contribute to their understanding and appreciation for the refuge's natural resources. For these reasons, we have found this use to be consistent with the U.S. Fish and Wildlife Service's policy on the appropriateness of refuge uses (603 FW 1).

We are limiting the use to non-competitive events for several reasons. First, in standard orienteering competitions, participants must run the course in the shortest possible time. This could disturb wildlife more than walking would, and has greater potential to conflict with other compatible, priority and non-priority public uses of the refuge. To ensure the health and safety of participants, organizers would likely bring in potable water to various locations along the route (Orienteering USA 2013). This would increase potential for habitat and wildlife disturbance, particularly if large quantities of water must be transported into several locations. In addition, these water containers would be a source of litter if not disposed of properly. There are other logistical considerations involved in competitions as well including the need for a registration area, awaiting area, a finish area, and setting up and taking down checkpoints. Competitions usually include spectators as well as participants, and can include large numbers of both. All of these factors would increase potential disturbance to wildlife and habitat and conflicts with other users; therefore, we would not allow competitive orienteering events on refuge lands.

Reference

Orienteering USA. 2013. Rules for Orienteering USA Sanctioned Events. January 1, 2013. Available online at *http://www.us.orienteering.org/sites/default/files/userfiles/u6/rules-2013-jan.pdf.*

COMPATIBILITY DETERMINATION

USE: Orienteering

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-406k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." ((16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." ((16 U.S.C. 460k-1) (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is the teaching of map and compass skills by having participants follow a preset course from station to station across a natural area. This use is not a priority public use of the National Wildlife 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?
The location of any orienteering course allowed would be at the discretion of the refuge manager, considering factors such as ease of finding, sensitivity of surrounding flora, resilience of the selected path or general area designated for use to foot traffic, safety of participants, etc. The use could occur at any of the three units of Sunkhaze Meadows NWR. It would occur on roads, trails, off-trail, or some combination of these. Visitors participating in other approved

public uses are already allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

(c) When would the use be conducted?
The use would be conducted during daylight hours when the refuge is open to other public uses.

(d) How would the use be conducted?
Traditional orienteering is a cross-country competition or "meet" run from point to point through natural terrain, where participants must navigate with map and compass. We are not contemplating allowing competitive meets; rather, we are intending to allow this use only to small groups of scouts or students whose leaders wish to set up a course as an educational exercise for teaching map and compass skills. We have received no requests for this activity to date, so we anticipate the number of visitors participating in this activity to be small and occasional. All aspects of the event would be controlled by a special use permit (SUP), which would only be given to competent adults who have adequate experience and safety and first aid training. Permittees would be required to remove any flags or other marking used to identify the control points promptly at the end of the event.

(e) Why is this use being proposed?
During public scoping for the refuge's comprehensive conservation plan (CCP), the Friends of Sunkhaze requested we open the refuge to this use. This use introduces individuals (including youth), potentially new audiences, to the refuge; it additionally introduces them to a healthy outdoor challenge, and map and compass skills important to budding naturalists in the State of Maine, where there are many wild lands to be explored. This use may support priority public uses at the refuge by educating visitors on skills (map and compass skills) they may find useful, particularly if they decide to explore off-trail. It also promotes safety in the outdoors by teaching skills that can prevent visitors from getting lost on the refuge and in other natural areas, particularly when going off-trail.

AVAILABLITY OF RESOURCES:

Annual costs associated with the administration of geocache SUPS on the refuge are estimated below:

Refuge biologist (GS11) (review SUP applications, coordinate) 1/2 days/yr:	$168
Administrative Assistant (GS7) (SUP preparation and administration) 1 hr/yr:	$ 21
Total:	**$189**

The refuge now has, and is anticipated to have into the future, adequate staff and funding to manage this use.

ANTICIPATED IMPACTS OF THE USE:

At current and project levels of use, we expect only negligible adverse impacts to refuge wildlife and habitats from allowing occasional orienteering. Given that we have had no requests to date, we anticipate the numbers of visitors participating in this activity and frequency of occurrence

would be low, and would not add appreciably to the impacts associated with other, existing public uses of the refuge. We only expect minimal and temporary disturbance caused by the mere presence of humans. Also, we do not anticipate any impacts to federally or State-listed threatened or endangered species.

Impacts to Wildlife Species:
Disturbances from recreational activities vary with the wildlife species involved and the activity's type, level, frequency, duration, and the time of year it occurs. The responses of wildlife to human activities include avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Kahl 1991, Klein 1993, Whittaker and Knight 1998), the use of suboptimal 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, Whittaker and Knight 1998), attraction (Whittaker and Knight1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Visitors to the refuge engaged in orienteering would generally be walking or running along refuge trails and roads, or in other designated areas that are also open for other public uses. The presence of people walking on refuge lands can lead to displacement of animals using these areas, although disturbance usually is a negligible influence on large mammal distributions and movements (Purdy et al. 1987; Boyle and Samson 1985). Some mammals may become habituated to humans, making them easier targets for hunters. Disturbance can have other effects including shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991).

The effects of roads and trails on animals are complex. Trail use can disturb areas outside the immediate trail corridor (Trails and Wildlife Task Force 1998, Miller et al. 2001). Bird communities in this study were apparently affected by the presence of recreational roads and trails, where common species (e.g., American robins) were found near trails and rare species (e.g., grasshopper sparrows) were found farther from trails. Songbird nest failure was also greater near trails. The effects on other forms of wildlife appear to be short-term with the exception of breeding bird communities.

A study by Miller, Knight, and Miller (1998) indicates that species composition and nest predation was altered adjacent to trails in both forested and grassland habitats. It appears that species composition changes are due to the presence of humans and not the trail or roadway itself. On the other hand, nest predation does appear to be a function of the trail that allows access to mammalian nest predators. Several studies have examined the effects of recreationists on birds using shallow-water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981, Burger 1986, Klein 1993, Klein et al. 1995, Rodgers and Smith 1995, Rodgers and Smith 1997, Burger and Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbances from recreation activities have at least temporary effects on the behavior and movement of birds within a habitat or localized area. Anticipated impacts of orienteering include temporary disturbances to species using habitats along trails or roads, as well as in the areas directly adjacent to trails or roads, as well as in any other area where the use is allowed. It is anticipated that any orienteering routes that are placed

on the refuge would be placed near a parking area and trail, and would be temporary. Thus, disturbances are likely to be short-term and minimal due to the transient nature of the activity. It is possible, but not likely, that there may be nest abandonment of bird species nesting on, or next to, trails and other areas used for this activity if the use is too frequent during breeding season. Long-term impacts may include certain wildlife species avoiding trail corridors and other areas should this use become too regular over time.

To reduce impacts to wildlife from this use, we would limit this use to designated trails, roads, and other areas already open to off-trail use by the public. We would limit this use to areas away from any sensitive habitats or rare natural communities and areas where rare, threatened, or endangered species are not known to occur.

Impacts to Soils and Vegetation:
The use of trails and gravel roads could lead to soil and leaf litter compaction, exposure of tree roots, direct trampling of plants, the introduction of invasive species, and changes in the plant communities up to 6 feet away from trails (Kuss 1986). Impacts of offtrail and offroad use tend to be greater than use on trails and roads. Offtrail and offroad impacts include a reduction in the density of plants near trails, soil compaction, increased erosion, and damage or killing of plants (Trails and Wildlife Taskforce 1998).

People running cross-country may create damage to soft surfaces, muddy areas, and thick shrubs or other vegetation, but this can be mitigated in advance by proper placement of the route. To limit impacts to plants and vegetation from this use, we would limit it to designated trails, roads, and other areas generally open to the public. The areas where this use would be are open to the public for other uses, not sensitive habitats or rare natural communities, or areas where rare, threatened, or endangered species occur.

The refuge would take all reasonable measures to prevent or minimize any potential negative effects to soils and plants, and would periodically evaluate the roads, trails, and other areas where visitors are allowed to orienteer to assess and prevent degradation. If evidence of unacceptable adverse impacts appears, the refuge would switch to other areas for this use, or curtail it, as deemed appropriate.

Based on the information provided above and the projected levels of use, the refuge anticipates that there would be minimal adverse impacts to soils and vegetation from occasional orienteering. With proper management, this use would not result in any greater than negligible short and would not result in any long-term impacts that would adversely affect the purposes of the refuge or the mission of the Refuge System.

On the positive side, the students engaged in orienteering are learning about maps, compasses and navigation in the outdoors, are getting outdoor exercise, and observing new places. They may be encountering a national wildlife refuge for the first time, and may learn about the Service and the refuge through this encounter, as well as feel more comfortable in the outdoors and see some wildlife as part of their experience.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible ___x___

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- The orienteering event may not be competitive, and would be limited to 20 participants or less.
- All organizers wishing to set us a temporary route must apply for a SUP, and work with refuge staff to find a good location that works from an orienteering perspective, a safety perspective, and that also would not unduly impact refuge resources.
- Organizers must have suitable safety training (i.e., first aid and CPR) and a plan in place to adequately train and monitor participants so that they do not get lost or injured.
- Organizers may only use temporary flags or marks and must remove all flagging promptly after the exercise.

JUSTIFICATION:

While orienteering is not a priority public use of the National Wildlife Refuge System (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997), it can support priority public uses, particularly at the Sunkhaze Meadows Unit of the refuge. Allowing orienteering, as specified above, at Sunkhaze NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. Because this use is expected to be low and infrequent and the refuge manager would determine the location(s) where the activity would be allowed, 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 National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Orienteering would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered

species known to occur on the refuge. Therefore, no significant adverse effects from orienteering are anticipated. This activity would not materially interfere with or detract from the mission of the Refuge System because of the limited impacts to refuge resources and the opportunity to reach other users as supporters of the Refuge System. In fact, it contributes to the Refuge System mission by building skills that make participants safer and more comfortable in natural settings and introducing new audiences (particularly young people) to the refuge and the National Wildlife Refuge System. These users may take the time to learn more about the refuge and may build support for the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36-41.

Boyle, S.A., and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation.

——— 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123-130.

Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. Journal of Comparative Physiological Psychology 95:676-684.

——— 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. Environmental Conservation 22:56-65.

Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation 18:39-51.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Klein, M.L. 1989. Effects of high levels of Human Visitation on Foraging Waterbirds at J.N. "Ding" Darling NWR, Sanibel, Florida. Final Report to USFWS. 103 pp.

——— 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454-1465.

Knight, R.L., and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. *In:* Glinski, R.L., B.G. Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, S.W. Hoffman, C.E. Ruibal, D.L. Krahe, D.L. Owenseds., Proceedings of the southwest raptor management symposium and workshop.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Trans. 56th National Association of Wildlife and Natural Resources Conference. Pp. 238-247.

——— 1995. Wildlife responses to recreationists. Pp. 51-69 in: Knight, R.L. and K.J. Gutzwiller eds., Wildlife and recreationalists: coexistence through management and research. Island Press, Washington, DC. 372 pp.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kuss, F. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management. 10:638-650.

Kuss, F.R., and A.R. Graefe. 1985. Effects of recreation trampling on natural area vegetation. Journal of Leisure Research.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

——— 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410 (also see corrigendum in Journal of Wildlife Management 54:683).

Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, and N.A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130

Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

——— 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: a handbook for trail planners. Colorado State Parks, Denver, CO. 51pp.

Ward, D.H., and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

Finding of Appropriateness of a Refuge Use (603 FW 1, Exhibit 1)

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Cross-country Skiing and Snowshoeing

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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**_X_

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: Sunkhaze Meadows National Wildlife Refuge

Use: Cross-country Skiing and Snowshoeing

Narrative

Wildlife observation, photography, hunting, and interpretation are priority public uses as defined 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) and are to receive enhanced consideration over other general public uses. While cross-country skiing and snowshoeing are not priority public uses, these uses facilitate the six priority public uses (hunting, fishing, wildlife observation, photography, environmental education, and interpretation) at Sunkhaze Meadows National Wildlife Refuge. The refuge is located in Maine where the ground can be covered with snow from November to April. In Maine, the traditional means of access to outdoor destinations during winter months is via skis and snowshoes. Due to the snow cover, visitor impact is minimized during winter months since the ground is not being compressed and fewer species and fewer numbers of wildlife are present. Trails are not cleared or groomed in winter, and snowshoes or skis are often necessary to access the refuge for priority public uses during the winter months. Cross-country skiing and snowshoeing are historic uses of the refuge, and are consistent with the environmental assessment prepared for the refuge's establishment (USFWS 1988, pg. 35). These uses have been allowed on the refuge since the refuge was established with no significant adverse effects observed. These uses also facilitate furbearer management by allowing trappers better access to their traps during the winter months. For these reasons, we have determined that cross-country skiing and snowshoeing are 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). 1988. Final environmental assessment: proposal to establish Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 5, Newton Corner, Massachusetts. 56p.

COMPATIBILITY DETERMINATION

USE: Cross-country skiing, snowshoeing

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-406k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." ((16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." ((16 U.S.C. 460k-1) (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:

"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

The use is allowing cross-country skiing and snowshoeing on Sunkhaze Meadows National Wildlife Refuge (NWR, refuge). The use involves modified foot-travel over the surface of the snow or ice. These uses are not priority public uses; however, they facilitate wildlife observation, wildlife photography, hunting, and interpretation during winter months.

(b) Where would the use be conducted?

Most of the skiing and snowshoeing would occur along designated public use trails and access roads at the Sunkhaze Meadows Unit of the refuge where underbrush is cleared and the going is marked and relatively easy. However, a small percentage of visitors may wish to explore off-trail at any of the three refuge units.

(c) When would the use be conducted?
Use would be determined by snow accumulation. Typically in central Maine, use would be limited to November through March but can vary considerably year to year. The refuge would be open to these uses from during normal refuge open hours, sunrise to sunset.

(d) How would the use be conducted?
The uses are self-regulating with trail signs indicating appropriate routes of travel. The trails are not groomed. Provided staff resources are available, refuge staff would remove fallen trees and limbs. Visitors participating in these activities are allowed off-trail.

(e) Why is the use being proposed?
While skiing and snowshoeing are not priority public uses, they facilitate visitor participation in priority public uses on refuge lands during winter months. In Maine, the ground can be covered with snow from November to April. Traditional means of access to outdoor destinations during winter months is via skis and snowshoes. Due to the snow cover, visitor impact is minimized during winter months since the ground is not being compressed and fewer species and fewer numbers of wildlife are present. Trails are not cleared or groomed in winter, and snowshoes or skis are often necessary to access the refuge for priority public uses during the winter months. Cross-country skiing and snowshoeing are historic uses of the refuge, and are consistent with the environmental assessment prepared for the refuge's establishment (USFWS 1988, pg. 35). These uses have been allowed on the refuge since the refuge was established with no significant adverse effects observed. These uses also facilitate furbearer management by allowing trappers better access to their traps during the winter months.

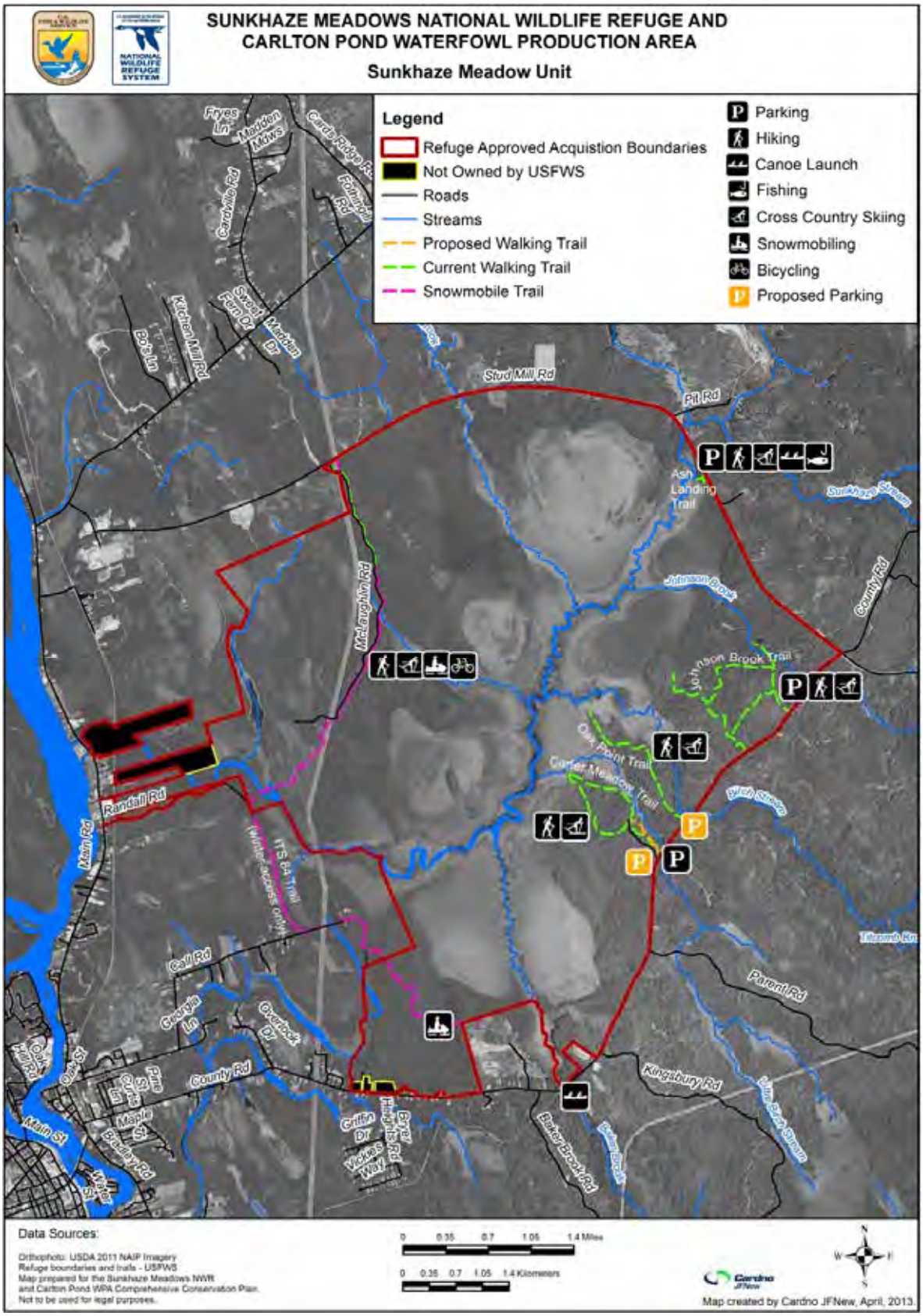
AVAILABLITY OF RESOURCES:

The refuge has a trail system in place to support priority public uses, and these trails are already being maintained for these purposes. Allowing cross-country skiing and snowshoeing on these trails would not increase the maintenance or operational needs. Refuge staff and volunteers maintain signs designating the location of trails, but this time is minimal and can be completed with current refuge funding.

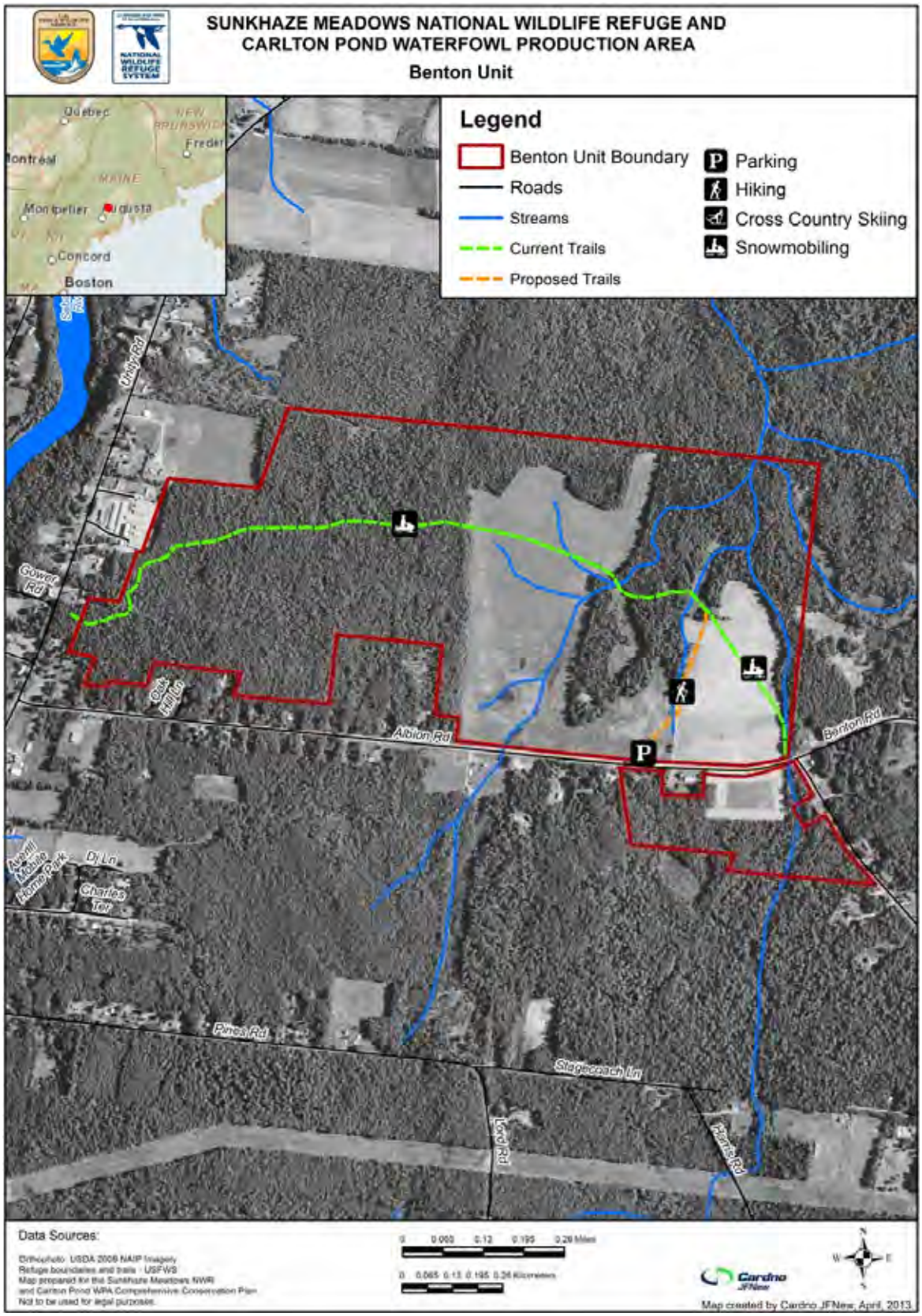
Trail maintenance:	$450
Signage and publications:	$200
Law enforcement patrol:	$800
Total:	**$1,450**

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.

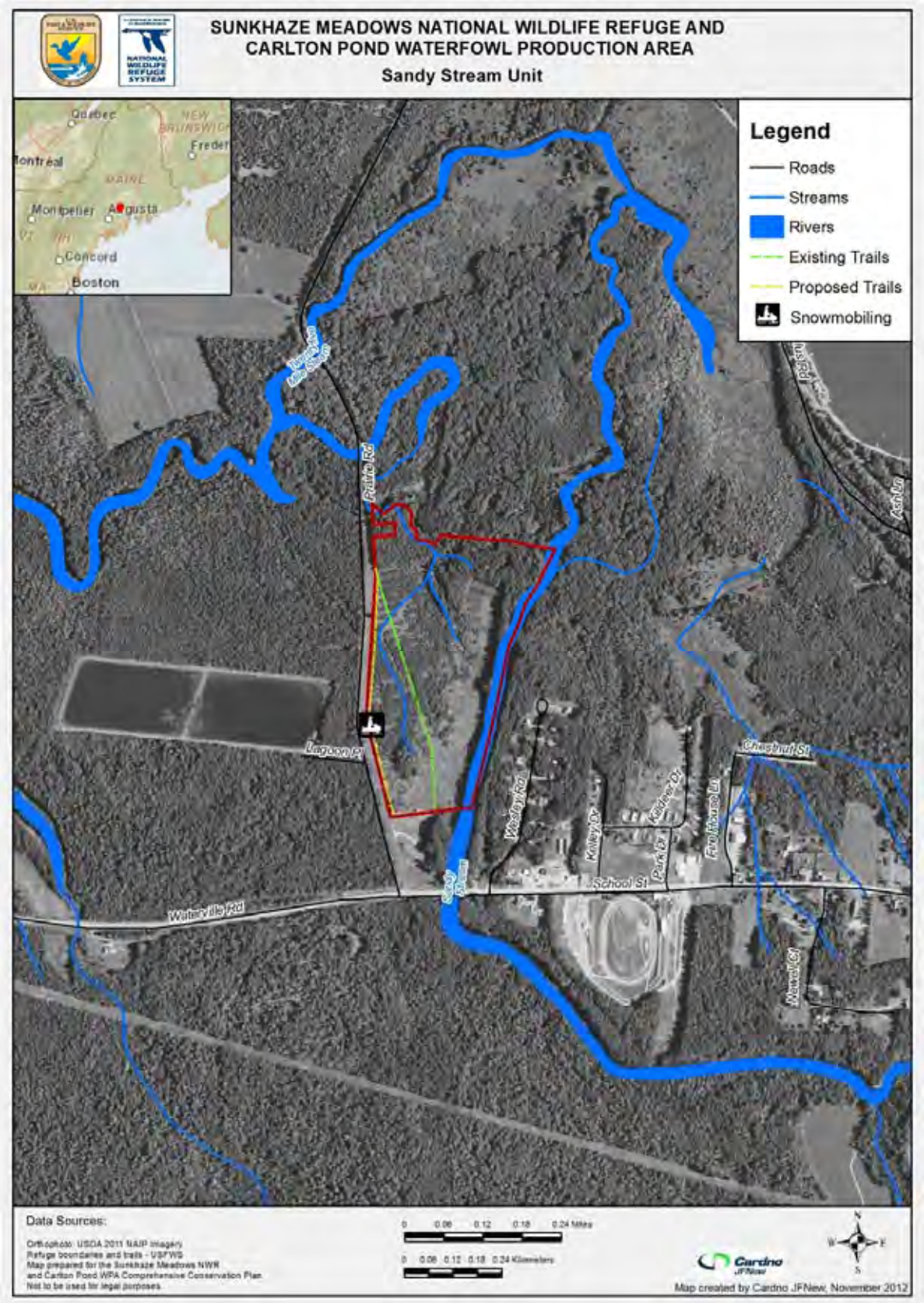
Map B.19. Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.20. Benton Unit of Sunkhaze Meadows National Wildlife Refuge.



Map B.21. Sandy Stream Unit of Sunkhaze Meadows National Wildlife Refuge.



ANTICIPATED IMPACTS OF THE USE:

No impacts are expected on any threatened or endangered species, whether federally or State listed. No critical habitat has been identified in the vicinity of any refuge trails or roads, where this use is concentrated. Allowing these areas to be used for recreational use provides users with a quality wildlife-oriented recreational experience, which is a refuge objective and is related to a goal of the National Wildlife Refuge System. There have been no indications that skiing or snowshoeing on Sunkhaze Meadows NWR causes problems for wildlife other than minimal and temporary disturbance caused by the mere presence of humans. Some impacts such as free-roaming pets, littering, and wildlife disturbance can be expected, but this is not anticipated to be significant.

In general, negative effects on habitat and wildlife associated with cross-country skiing and snowshoeing are considered minimal. Cross-country skiing and snowshoeing are limited to winter and require sufficient snow cover to allow access. Most wildlife species are less active during winter months, sensitive migratory birds have largely left the refuge. With the exception of bald eagles which start nesting in early spring (February or March), it is not breeding season for any of the wildlife that may be present. Surface water and soil may be frozen for at least a portion of this time, most vegetation is dormant, and sensitive habitat would largely be protected by a surface layer of snow. In addition, skis and snowshoes are designed to distribute weight, decreasing potential for eroding soils near waterways or soil compaction. Most visitors limit skiing and snowshoeing to established roads and trails. The following are more specific descriptions of potential impacts associated with cross-country skiing and snowshoeing.

Effects on Vegetation:
Short-term effects of trampling 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 limits the ability of plants, particularly rare and sensitive species, to revegetate affected areas (Hammitt and Cole 1998). Kuss (1986) found 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.

However, overall, effects on vegetation from skiing and snowshoeing are expected to be minimal. As mentioned previously, 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. Because of difficult access, visitors that ski or snowshoe usually remain on designated roads and trails. Designated roads and trails do not have any known occurrences of rare plant species on their surface that would be impacted by these uses.

Effects on Soils:
Soils can be compacted and eroded as a result of continued use of roads and trails. Overall, effects on soils are expected to be minimal. Skiing and snowshoeing are limited to winter and require sufficient snow cover to allow access. The soil surface would likely be frozen for some of the season, making it much less vulnerable to compaction or erosion. 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. Over the long term, the risk of erosion and sedimentation problems that might affect soils in these habitats would increase with increased visitor use and trail use. However, given the time of year, locations, methods used, and minor increases expected, increased levels of skiing and snowshoeing are not expected to significantly affect soils on the refuge.

Effects on Wildlife:
Short-term and long-term adverse impacts are not expected for wildlife populations in relation to the expected low use of snowshoeing and cross country skiing. Disturbances 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 use of trails in the winter for cross-country skiing and snowshoeing have similar wildlife disturbance effects as those which occur through pedestrian travel on these trails during the other seasons. One of the primary differences is that many migratory birds are not present, 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. The most commonly observed wildlife in the winter is deer, snowshoe hare, chickadees, nuthatches, and ravens. Both bird and mammal species which are present and active this time of year 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).

We would take all necessary measures to mitigate any negative effects on wildlife associated with skiing and snowshoeing. We would evaluate roads, trails, and activities periodically to assess potential negative effects. If evidence of unacceptable adverse effects is observed, we would curtail or discontinue activities as needed. We would post and enforce refuge regulations, and establish, post, and enforce closed areas as needed. However, negative effects on wildlife are expected to be minimal. As discussed previously, cross-country skiing and snowshoeing are limited to winter months and require sufficient snow levels to allow access. Additionally, many refuge trails become difficult to access during winter conditions as access to main trail heads are only minimally maintained. This greatly reduces the numbers of users accessing refuge trails for these uses and thereby, minimizes impacts.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible ___x___

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Compliance with regulations would be achieved through education, signage, and law enforcement which would result in minimizing negative impacts to refuge habitat and wildlife.

- The refuge would be open to these uses during regular refuge hours (sunrise to sunset for most uses, hours for hunting differ) and access to any restricted areas would be enforced.

JUSTIFICATION:

While cross-country skiing and snowshoeing are not a priority public uses of the National Wildlife Refuge System (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997), they do facilitate priority public uses at Sunkhaze Meadows NWR.

Allowing cross-country skiing and snowshoeing at Sunkhaze NWR would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, cross-country skiing and snowshoeing are uses that support wildlife-dependent priority public uses with minimal adverse impacts on refuge resources. Negative effects on habitat and wildlife associated with cross-country skiing and snowshoeing are considered minimal because cross-country skiing and snowshoeing are limited to winter and require sufficient snow cover to allow access. Most wildlife species are less active during winter months, sensitive migratory birds have largely left the refuge, and it is not breeding season for any of the wildlife that may be present. Surface water and soil may be frozen for at least a portion of this time, most vegetation is dormant, and sensitive habitat would largely be protected by a surface layer of snow. This is an ongoing use of the refuge and there have been no indications that skiing or snowshoeing on Sunkhaze Meadows NWR causes problems for wildlife other than minimal and temporary disturbance caused by the mere presence of humans. Because of this, it is consistent with the wildlife and habitat aspects of the refuge's purposes, the Service policy on compatible uses, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System.

Cross-country skiing and snowshoeing would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species known to occur on the refuge. Therefore, no significant adverse effects from these uses are anticipated. By supporting priority public uses, allowing this use

supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013) and the refuge's purpose associated with allowing wildlife-oriented recreational opportunities. This activity would not materially interfere with or detract from the mission of the Refuge System, because of the limited impacts to refuge resources, it facilitates priority public uses, and the opportunity to attract visitors to the refuge and build support for the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Beale, C.M. and P. Monaghan. 2004. Human disturbance: people as predation-free predators? Journal of Applied Ecology 41:335-343.

Hammitt, W.E. and D.N. Cole. 1998. Wildlife Recreation: Ecology and Management (2nd edition). New York: John Wiley & Sons. 361p.

Kuss, F.R. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management 10:638-650.

Roovers, P., K. Verheyen, M. Hermy, and H. Gulinck. 2004. Experimental trampling and vegetation recovery in some forest and heathland communities. Applied Vegetation Science 7:111-118.

U.S. Fish and Wildlife Service (USFWS). 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Snowmobiling

This form is not required for wildlife-dependent recreational uses, forms of 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?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(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?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

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 would generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X 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** X

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: Sunkhaze Meadows National Wildlife Refuge

Use: Snowmobiling

Narrative

The State of Maine Interstate Trail System (ITS) is an extensive snowmobile trail network that connects Maine to neighboring states and Canada. All three of the refuge units include a portion of a snowmobile trail. Snowmobile recreation is a critical part of the local economy during winter months and that of central Maine. The refuge is located in Maine where the ground can be 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, particularly hunting and fishing. 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 visitation is usually more limited.

The original ITS-84 snowmobile trail at the Sunkhaze Meadows Unit was established before the refuge was created in 1988. The old trail traversed a portion of the refuge which included sensitive wetland habitats. After the refuge was created, the refuge manager worked with the local snowmobile club to reroute the trail, moving it away from the sensitive wetland habitats. The current 4.6-mile portion of the trail that crosses the refuge passes through forested upland. Relocation of the trail to off-refuge lands would require substantial effort and expense, and would undoubtedly result in greater impacts on wetlands than the existing trail, which impacts no wetlands in the vicinity of the refuge. Due to the snow cover, visitor impact is minimized during winter months since the ground is often frozen and fewer species and fewer numbers of wildlife are present. This is an historic use of the refuge, and is consistent with the environmental assessment prepared for the refuge's establishment (USFWS 1988, pg. 5). This use has been allowed on the refuge since the refuge was established with no significant adverse effects observed.

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). 1988. Final Environmental Assessment: Proposal to Establish Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. August 1988. U.S. Department of the Interior Fish and Wildlife Service Region 5. Newton Corner, Massachusetts. 56 pp.

COMPATIBILITY DETERMINATION

USE: Snowmobiling

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge

DATE ESTABLISHED: November 22, 1988

ESTABLISHING AUTHORITIES:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-406k-4; 76 Stat. 653)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "... for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." ((16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." ((16 U.S.C. 460k-1) (Refuge Recreation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is snowmobiling. 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), and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?
Snowmobile use is currently permitted on a limited portion of the Sunkhaze Meadows Unit of Sunkhaze Meadows National Wildlife Refuge (NWR, refuge) as part of the State of Maine Interstate Trail System (ITS) and on two other designated trails, one each on the Benton Unit and Sandy Stream Unit. The portion of the ITS-84 trail on Sunkhaze Meadows Unit is approximately 4.6 miles long. Trails on the Benton Unit and Sandy Stream Unit are 1.0 mile and 0.5 miles respectively.

(c) When would the use be conducted?
Use usually occurs from January through March depending on ice and snow conditions, which vary yearly. Snowmobiling occurs when snow conditions are suitable, but no earlier than December 1 and no later than April 15.

(d) How would the use be conducted?
In Maine, snowmobile operators are required to secure landowner permission prior to traveling across lands other than their own, and snowmobile travel is permitted only on designated trails within the Statewide (ITS) trail system (unless written landowner permission is otherwise secured for off-trail operation). Throughout the ITS trail system, local snowmobile clubs are responsible for maintaining the trails within the clubs' designated areas of operation.

Snowmobile access and use on the refuge would be conducted according to applicable provisions of 50 CFR 27.31 ("General Provisions Regarding Vehicles"), applicable sections of the Maine 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).

The Sunkhaze Meadows Unit snowmobile trails and trail corridors are currently maintained by members of the Pine Tree Snowmobile Club of Milford, Maine and by the G and G Trailblazers Snowmobile Club of Greenbush, Maine. The Benton Unit Trail is maintained by the Country Cousins Snowmobile Club of Benton, Maine. The Sandy Stream Unit Trail is maintained by the Unity Snow Dusters Snowmobile Club of Troy, Maine.

Snowmobile clubs would continue to be required to obtain special use permits (SUP) for trail maintenance activities, including placement of appropriate signs. Members of the local clubs are responsible for placing trail junction, trail number, safety, and speed limit signs along the trails prior to December 1, maintaining them through the period of snowmobile use, and collecting signs and picking up any litter prior to the reopening of refuge roads after the mud season closure (typically prior to Memorial Day weekend). The local clubs also are responsible for grooming trails. Groomed trails typically are groomed to a width of approximately 10 to 15 feet depending on the underlying road width and snow conditions. Individual trails are groomed by permittees one to three times per week, depending on snow and trail conditions. Grooming generally occurs at night. Not all trails are regularly groomed. In late summer or fall, the clubs also maintain trails, as necessary, by cutting back woody brush that restricts trail width and removing trees that may have fallen across trails. New trail construction is not permitted.

Maximum allowed speed for snowmobiles on the refuge currently is 35 mph and is consistent with the speed limit on adjacent land ownerships. Travel is not permitted off designated trails. During the period when snowmobiles are permitted on the refuge, use occurs daily, but varies greatly in intensity. Snowmobilers typically travel in groups of two or more.

The operation of snowmobile on the refuge shall comply with all applicable State rules and regulations. We would not permit competitive snowmobiling events. No parking areas would be provided on the refuge. No all-terrain vehicles are permitted on the refuge.

Snowmobile access and use of the refuge are monitored by refuge staff and by members of the local snowmobile clubs. Additional monitoring is conducted by the local State game warden. We intend to monitor snowmobile use at the refuge via winter surveys and/or traffic counters in the future. We would also monitor the condition of culverts, bridges, pond and streams in spring and summer, and identify and close undesignated trails on the refuge.

(e) Why is this use being proposed?
Snowmobile recreation is a critical part of the local economy during winter months. The refuge is located in Maine where the ground can be 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. Relocation of the trail to off-refuge lands would require substantial effort and expense, and would undoubtedly result in greater impacts on wetlands than the existing trail, which impacts no wetlands in the vicinity of the refuge. Due to the snow cover, visitor impact is minimized during winter months since the ground is often frozen and fewer species and fewer numbers of wildlife are present. This is an historic use of the refuge, and is consistent with the environmental assessment prepared for the refuge's establishment (USFWS 1988, pg. 5). This use has been allowed on the refuge since the refuge was established with no significant adverse effects observed.

AVAILABLITY OF RESOURCES:

With the hiring of a refuge officer, and a zone officer for Maine, Vermont, and New Hampshire, the resources necessary to provide and administer this use, at its present levels, are available within current and anticipated refuge budgets. Staff time associated with administration of this use relates to overseeing trail maintenance, issuing SUPs, and monitoring compliance with their conditions, enforcing laws, monitoring public use, and monitoring impacts on natural resources.

The refuge manager would administer the program. A wildlife biologist would monitor its effects on refuge resources. The refuge officer would monitor visitor use and conduct law enforcement for visitor safety and resource protection.

We estimate below the annual costs associated with the administration of snowmobiling on the refuge.

Overall oversight of program; Coordinate with State of Maine:	$1,000 GS-13 Refuge Manager
Administer SUPs/Coordinate with snowmobile clubs/ Oversight of trail maintenance:	$2,000 GS-12 Deputy Refuge Manager
Law enforcement patrol/Visitor-resource protection/ Public use monitoring/Enforcement/Outreach:	$3,000 GS-9 Refuge Officer
Resource impacts/Monitoring:	$3,000 GS-11 Wildlife Biologist
Snowmobile gas/Maintenance:	$1,000
Total:	**$11,000**

All maintenance of snowmobile trails would be the responsibility of other parties (snowmobile clubs, volunteers, etc.). The refuge owns and operates snowmobiles for carrying out law

enforcement, refuge operations, and monitoring public use. Officers from Maine Department of Inland Fisheries and Wildlife occasionally supplement law enforcement coverage on the refuge, at no cost to us.

ANTICIPATED IMPACTS OF THE USE:

The original ITS-84 snowmobile trail at the Sunkhaze Meadows Unit was established before the refuge was created in 1988. The old trail traversed a portion of the refuge which included sensitive wetland habitats. After the refuge was created, the refuge manager worked with the local snowmobile club to reroute the trail, moving it away from the sensitive wetland habitats. The current 4.6-mile portion of the trail that crosses the refuge passes through forested upland. Relocation of the trail to off-refuge lands would require extensive effort and expense, and would undoubtedly result in greater impacts on wetlands than the existing trail, which impacts no wetlands in the vicinity of the refuge.

Currently, the snowmobile trail at the Sandy Stream Unit bisects the refuge. To minimize habitat fragmentation and potential disturbance to wildlife associated with trail use and maintenance activities, we propose relocating the trail to the unit's western edge, near the existing road (see map B 24). Effects of relocating the trail are discussed in the refuge's draft comprehensive conservation plan (CCP) and environmental assessment (EA) (USFWS 2013).

Wildlife Impacts:
The area on the refuge encompassed by snowmobile trails totals approximately 12.4 acres, or about 0.1 percent of the refuge's total area. This includes lengths of snowmobile trails on all three units multiplied by an expected width of 15 feet. Snowmobile trails traverse the spruce-fir, northern hardwood, and mixed conifer-hardwood habitats that are typical on the refuge. Wildlife species occurring in the habitats traversed by trails include: various migratory birds, resident birds (including spruce and ruffed grouse), snowshoe hare, moose, white-tailed deer, and various furbearers. Black bears, reptiles and amphibians, beaver, and brook trout also occur in habitats traversed by snowmobile trails, but normally are within hibernacula or under ice when snowmobiling occurs. Deer wintering areas located in the northeast corner of the Sunkhaze Meadows Unit and the Benton Unit are outside the snowmobile trails areas. Also, many of the bird species present during the summer and fall have migrated to southern wintering grounds.

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.

Snowmobiles are capable of covering large areas 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. That may affect survival or reproduction. Animals may be in poorer condition going into the spring breeding season.

- 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 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.

- Changes in community composition and inter-species interactions.

- Improved predator access to prey wintering areas (a benefit to predators, but a negative impact to prey).

- Direct mortality from snowmobile-wildlife collisions.

Some potential, positive impacts of snowmobiling and other forms of human disturbance on wildlife follow:

- Reduced energy expenditure. Snow compaction and trail creation by snowmobiles may reduce energy expenditure in deep snow for animals that follow snowmobile trails.

- Improved access to resources. Snow compaction and trail creation by snowmobiles may expand access to foraging areas, for animals using trails.

Although a moderately extensive body of literature treats 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 Sunkhaze Meadows NWR difficult. The differences in methodology among studies make it difficult to compare them, and have compounded the problem. As a result, different studies have found apparently contradictory results that seem to be applicable only locally.

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 type

- 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. Appropriate management can mitigate many of the negative effects.

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.

Most ungulates react more strongly (are more likely to flee, travel a greater distance) to a person on foot than a person on a snowmobile. Stopping or getting off a vehicle creates more disturbance than a person on a continuously moving snowmobile (Oliff et al. 1999). Response to snowmobiles is greater in areas open to hunting than in areas closed to hunting.

No active flight responses were seen at distances greater than 650 feet. Response intensity increased with increasing size of a snowmobile group. The disturbance of wildlife tends to be less when human activities are fairly predictable both in location and behavior. Animals may habituate to predictable disturbance, and show less of a behavioral or physiological response. Snowmobile activities on fixed designated trails create fewer disturbances than activity that occurs randomly across the landscape (Oliff et al. 1999).

Wildlife seem to demonstrate a less intense response to disturbance when there is some sort of visual barrier between them and the source of disturbance created by vegetation and/or topography (Oliff et al. 1999).

Deer and moose are more likely to forage in the early morning or evening, therefore, these are the times they are most likely to encounter, and possibly be disturbed by, snowmobiles (Oliff et al. 1999).

Severinghaus and Tullar (1975) suggested that snowmobile disturbance might be energetically costly to deer. Although deer sometimes use snowmobile trails, those trails may not lead to the best foraging areas, or may help to concentrate foraging in a restricted area and contribute to

over-browsing. They recommended keeping snowmobile trails at least 0.5 miles from deer wintering areas. In a controlled experiment, Freddy et al. (1986) found that snowmobiles invoked flight responses in mule deer at distances less than 440 feet. Distances traveled by fleeing deer averaged 330 feet. Deer demonstrated low levels of response (alerting) up to distances of about 1,540 feet. Freddy et al. (1986) suggest that keeping snowmobile trails greater than 1,500 feet from deer would minimize any disturbance. The study found no evidence of increased mortality or impairment of reproduction, but deer may not have been disturbed often enough to show an effect.

Eckstein et al. (1979) experimentally exposed white-tailed deer to snowmobile activity, and found no differences in home range size, habitat use, or activity by white-tailed deer in areas with snowmobile activity versus areas without it. However, deer were displaced from an area within 200 feet of snowmobile trails. The study found that deer were less disturbed by snowmobile activity at night than during the day. Deer were found to use snowmobile trails occasionally, but did not seem to use snowmobile trails in preference to their own trails, or follow snowmobile trails beyond their normal wintering area. They concluded that, although there might be some energy savings for the deer from using snowmobile trails, the effects of snowmobiles forcing deer off of trails would counter balance those savings. They also recommended that snowmobile trails avoid deer wintering areas by rerouting through upland deciduous forest wherever possible.

Richens and Lavigne (1978) also found that white-tailed deer in Maine sometimes used snowmobile trails for short distances (less than 660 feet), especially when they were near bedding areas. Deer were more likely to use snowmobile trails under more severe winter conditions, when snow depths were greater. Deer were less likely to use snowmobile trails on wide logging roads that were less sheltered. Unlike the Eckstein et al. (1979) study, Richens and Lavigne found that deer could be persuaded to follow snowmobile trails over a mile beyond their own trail system when improved forage was provided at the new location. The study 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. Deer continued to use bedding areas close to snowmobile trails and did not appear to alter their activity patterns in response to snowmobiles, but snowmobile traffic in their study area was relatively light. The flight responses of deer 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. The poor condition of deer towards the end of winter may have contributed to this reduction in flight tendency. Richens and Lavigne also found deer were more likely to flee from snowmobiles traveling at high speeds than at low speeds (less than 10 mph).

In contrast to some other studies, Dorrance et al. (1975) found increases in white-tailed deer home range size, movement, and distance to snowmobile trails with increased snowmobile activity for an area previously closed to snowmobile use (but open to hunting). Deer failed to show these changes in movement patterns with increased snowmobile activity at a second study site that was open to snowmobile traffic but closed to hunting. At the second site, deer were displaced from the immediate vicinity of active snowmobile trails, but usually returned shortly after snowmobile activity stopped. That effect was seen even at very low levels of snowmobile

activity. The habituation of deer to snowmobile activity may have been facilitated at this second site, where hunting was not permitted. However, in this study, displacement of deer from snowmobile trails probably did not result in a significant impact on deer except during particularly severe winters and/or on poor winter ranges.

Huff and Savage (1972) found that white-tailed deer in Minnesota utilized conifer (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. Moen (1982) found that heart rates of captive white-tailed deer increased when they were approached by snowmobiles, even when no change in their behavior was discernible. Deer also failed to habituate to snowmobiles (as measured by elevated heart-rates) over the course of the experiment. Moen (1982) suggested that there might be an energy cost to elevated heart-rate.

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. Moose, in general, appear to habituate fairly readily to vehicle activity and will flee at shorter distances if they have become habituated.

The existing snowmobile trails are, at their closest point, approximately 2 miles west of the deer wintering area mapped within the Sunkhaze Meadows Unit. This 2-mile buffer consists of northern hardwood-mixed forest and peatland-wetland complex. This exceeds the recommended 0.5-mile buffer recommended by Freddy et al. (1986). At Benton Unit, the existing snowmobile trail passes through the edge of a mapped deer overwintering area. However, the vegetation in this portion of the site has changed from forest to grassland since it was originally mapped. Therefore, this area does not currently contain suitable habitat for deer overwintering. Instead, the edge of the northern hardwood-mixed forest (where suitable overwintering may occur) is located approximately 500 feet to the north, although most deer likely overwinter further within the mapped deer wintering area, away from the forest edge.

We expect adverse impacts on these species to remain low for the following reasons: 1) this use is a traditional use of refuge lands and has been occurring for many years, 2) refuge staff have not observed adverse impacts to these species in all of these years, 3) snowmobile trails avoid deer wintering areas, and 4) this use is expected to remain low and is therefore not expected to be intense or frequent. Under all alternatives, we would continue to monitor the refuge for potential impacts and would limit access or close areas as needed to protect resources. We would also continue to vary from State regulations in that we would not allow baiting on any refuge unit or at Carlton Pond WPA.

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).

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. When disturbed, females fishers may move their den sites (Oliff et al. 1999). Weasels and pine 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 prey populations (small mammals).

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).

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 2 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. If extensive, off-trail snowmobile activity compacts large areas of snow, the impacts on small mammal populations may be significant (Olliff et al. 1999).

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. The current route of Maine ITS-84 trail and associated connector trail traverse mixed and hardwood forest. We are not aware of any nesting bald eagle pairs at the Benton or Sandy Stream Units. While we are not sure of exact locations of current eagle nests on the Sunkhaze Meadows Unit, it is unlikely current snowmobile use is adversely affecting this species on the refuge. This use is an ongoing use of the refuge and appears to have been occurring at relatively consistent rates over the past nearly two decades. Because snowmobiling begins before eagle nesting season begins, at the Sunkhaze Meadows Unit any nesting eagle pairs that may be

disturbed by this activity would be able to nest in suitable habitat on the refuge away from the snowmobile trails.

We would assess these trails and may re-route or close some of them if significant 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 stream amphibians. Much of the disturbances to wildlife noted in literature are from snowmobiles that are not on designated trails and are traveling all over the landscape in unpredictable ways. Restricting snowmobile traffic to designated trails helps to increase predictability. The existing trails have been in place for decades and predate the establishment of the refuge. The snowmobile use at Sunhaze Meadows NWR is currently at very low levels based on weekly law enforcement patrols the last 2 years which supports our assessment of that adverse impacts associated with this activity are expected to be and remain low.

Habitat Impacts:

Vegetation
Several studies have found that snowmobiles damage vegetation. This may involve direct, mechanical damage as well as the alteration of soil and substrate conditions important for plant growth. The extent of impacts depends on the plant species, their sensitivity to cold and mechanical damage, snow depth, winter severity, and soil type and slope, among others.

Neumann and Merriam (1972) found that after a single passage by a snowmobile, over 25 percent of all tree saplings at or above the snow surface were damaged severely enough to cause mortality. Seventy-eight percent of saplings showed some signs of damage. Species with rigid woody stems were the most vulnerable. All vegetation above the snow surface was eliminated mechanically in heavily traveled areas.

Wanek (1974, 1971) found that soil temperatures were significantly colder and more variable under snowmobile trails than under un-compacted snow. That change occurred after the first snow compaction event. Soil froze sooner, deeper, and remained frozen for a longer time than under un-compacted snow. Soils under snowmobile tracks thawed out as much as three weeks later than under control areas. Temperature regimes varied, depending on the soil type. Sandy soils remained colder in the winter than did organic soils. Soil temperatures under hardwood forests remained colder than under softwoods. Some species of spring plants under snowmobile trails experienced up to 20 percent winter mortality, or no growth, delayed growth, or delayed or reduced flowering. Underground root structures were frozen and damaged in some instances. Species with large underground storage structures experienced the greatest damage due to freezing. Wanek (1974) also found that in an alfalfa field subjected to snow compaction by snowmobiles, productivity decreased by 24 to 33 percent. Weedy species also showed an accompanying increase. The decline in productivity was steeper during a more severe winter than during a milder winter. Wanek (1974, 1971) also found conifer sapling damage and mortality from snowmobile trails, particularly under low snow conditions. The damage to white spruce was highest. Some species, including trembling aspen and raspberry, increased in areas of snowmobile activity.

Bogs appear to be particularly sensitive to snowmobile activity. Wanek (1974) found a decline in some bog plants, with increasing snowmobile activity. Although sphagnum appeared to be unaffected, declines were observed in bog laurel, leather leaf, small cranberry, and pitcher plant. Impacts appeared to be due to mechanical damage, cold penetration, and desiccation.

Pesant et al. (1985) tested the effects of snowmobiling on agricultural fields. They found that in certain forage types, snowmobile trails resulted in reduced or delayed spring growth, changes in species composition, and reduced forage yield. Impacts were attributed to reduced soil temperatures under compacted snow, and deeper frost penetration into the soil, with accompanying damage to plants. Foresman et al. (1976) also found an early spring reduction in the growth of bluegrass under snowmobile trails, but found that vegetation had recovered by early summer. Matted vegetation under snowmobile tracks may have kept soil temperatures lower in the spring, and made it physically more difficult for new growth to penetrate the matted layer.

Keddy et al. (1979) found that snow compaction was greatest when snowmobiles traversed an area on several different days (increased frequency) than if they traversed the same area multiple times on the same day (increased intensity). Increased frequency of snowmobile use resulted in a decrease in standing crop on an old field, but no significant decrease occurred with greater intensity. Some shift in plant community structure also was noted. No significant impacts on vegetation were observed on an ice-covered marsh. Negative impacts of snowmobiling on vegetation may result from lower temperatures affecting buds and food storage structures, and longer snow retention in the spring may affect early germination and growth. Matting of vegetation may affect seed dispersal from previous year’s seedpods.

Boucher and Tattar (1975) found that damage to vegetation and soils was greatest where snowmobile trails were located on steep (greater than 30 degrees) south-facing slopes. Damage primarily resulted from decreased snow depths (due to greater solar radiation), together with increased pressure of snowmobile treads on steeper slopes. On steep slopes, the surface organic layer, and in some instances the upper soil layer, were lost. Damage to plants included not only above-surface parts, but also damage to shallow root systems. Although vegetation recovered on flatter areas receiving moderate use, highly disturbed steep slopes did not.

Snowmobile use is limited to specific designated trails. Based on weekly law enforcement patrols, the current snowmobile use is at low levels and little unauthorized off-trail use occurs. We predict this use would remain low; therefore, it is not intense or frequent and is not expected to have noticeable adverse impacts to refuge habitats outside of the footprint of the trail itself.

Soil and Litter

The compaction of snow under snowmobile trails results in changes in thermal conduction and snow structure that cause snowmobile trails to melt more slowly in the spring and can create partially anaerobic conditions. The rates of litter decomposition may slow as a result. Neumann and Merriam (1972) found that the water holding capacity of snowmobile trails was significantly reduced. That could reduce the ability of the snow to hold water during spring runoff.

In contrast to this, Aasheim (1980) suggested that the delayed melting of compacted snowmobile trails might actually contribute to a reduction in peak runoff amounts.
Boucher and Tattar (1975) found that snowmobile activity on steep, south-facing slopes could disrupt or remove the surface layer of soil and increase erosion during spring rains. Some reports (Aasheim, 1980), indicate that soil erosion may be reduced on flatter areas under some circumstances because the compacted snow on snowmobile trails may protect against erosion from spring runoff.

There appears to be general agreement that snowmobile activity on steeper slopes can increase erosion, particularly with shallow snow depths and vegetation disturbance.

The impacts of snowmobiles on soils and vegetation under shallow snow conditions may be as significant as when snowmobiles travel on bare ground (Hammitt and Cole, 1998).

Foresman et al. (1976) found no evidence of soil compaction under snowmobile trails.
The anticipated impacts from snowmobiling include damage to vegetation from snowmobile activity during the winter and from brush clearing during the fall, and some potential for soil erosion. There are no known rare plants or plant communities along the present route of trail 18. Because much of the ITS trail is on a pre-existing road, where soils have already been compacted and vegetation has been removed, additional damage to vegetation and erosion should be minimal. Although the majority of trails on the Maine side of the refuge are also on roads, we would need to evaluate all Maine trails and may re-route or close them to minimize impacts. The maintenance of the Mountain Pond Road for snowmobile use encourages traffic by wheeled vehicles during the summer; they frequently drive on the road when the road is wet, thus increasing the potential for erosion. Installing gates at both ends of the road to prevent entry of vehicles outside of the snowmobile season would avoid that impact.
Snowmobile trails at Sunkhaze have been rerouted in the past to address concerns over soil and wetland impacts. There are no designated trails that occur on steep, south facing slopes. Refuge personnel would continue to monitor the trails for signs of impacts and would either close the trail or re-route the trail to a more suitable location.

Pollution:

Water Quality
Adams (1975) found high levels of hydrocarbons after ice-out in the water of a small (2.5 acres), shallow pond that had been experimentally exposed to snowmobile exhaust. Brook trout exposed to the pond water were shown to have incorporated exhaust components (hydrocarbons). Hydrocarbons increased from undetectable levels in the water, pre-treatment to 10 ppm, post-treatment. Exposed fish exhibited hydrocarbon levels of up to 1 ppm. Petroleum hydrocarbons can have pathological effects on fish at very low levels (less than 10 ppb) and may negatively impact reproduction and foraging (Adams 1975). Hydrocarbon concentrations were highest near the water surface after ice-out. Fish may be particularly vulnerable to hydrocarbon contamination in the early spring because they may be in poorer condition, and are more likely to be active near the water surface. The concentration of hydrocarbons in snow is likely to be particularly high on trails where 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). To what extent the bodies of water on the refuge are at risk of hydrocarbon pollution is unclear. Maine ITS-84 crosses over Sunkhaze Stream at the end of McLaughlin Road and the snowmobile trail at Benton crosses Fowler Brook over a wooden bridge. Snowmobiles can only cross Sunkhaze Stream when the water is frozen. The waterway is protected by a wooden bridge at Benton Unit. Based on the small numbers of snowmobiles using the refuge units, we expect that water pollution impacts would not be significant. Given current low levels of snowmobile use, recent improvements in snowmobile technologies, and large water volumes the impacts are expected to be minimal.

Air Quality
Bishop et al. (2001) found that snowmobiles accounted for 27 percent of the annual emissions of carbon monoxide in Yellowstone National Park, as well as 77 percent of the annual hydrocarbon emissions. Carbon monoxide production was reduced by 13 percent for vehicles using oxygenated fuels, but hydrocarbon emissions were unaffected. Fan-cooled snowmobiles had lower hydrocarbon emissions than liquid cooled machines.

Although automobiles substantially outnumber snowmobiles 16 to 1 in Yellowstone during the winter, snowmobiles are responsible for up to 90 percent of hydrocarbon and up to 69 percent of carbon monoxide emissions in the park (US GAO 2000). Additionally, 25 percent to 30 percent of snowmobile fuel is released unburned into the atmosphere (US GAO 2000).

The anticipated impacts from snowmobiles include some exhaust emissions to the air and possibly refuge streams. The refuge currently has no data on stream or air quality.

Noise
Snowmobile noise is readily detectable by wildlife at distances up to several kilometers. The effects of disturbance on wildlife are quite variable, and many species seem to be capable of habituating to it (Bowles 1995). There is no clear evidence for noise having an impact at the population level (Bowles 1995). Noise may have an impact on the experience of other human users on the refuge. We have not measured noise levels on the refuge, but they are probably noticeable near trails and on Sunkhaze Meadows NWR during busy winter weekends. Because of the ability of snowmobile noise to travel over great distances, much of the noise on the refuge probably comes from off-refuge snowmobile activity, over which the refuge has no control, as well as from on-refuge activity. We would minimize conflicts among users by restricting snowmobile use to designated trails, thus leaving the remainder of the refuge open to other users.

Summary of Anticipated Impacts:
Although the information available about the effects of snowmobiling on designated trails is incomplete, at its current and anticipated levels and patterns of use, we do not expect it to constitute significant short-term or long-term impacts separately or cumulatively. We would evaluate all trails every 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 located on existing utility powerlines and trails.. The location for 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 wildlife potentially affected are accustomed to that use, we consider impacts on wildlife minimal. Increases in emission regulations by the U.S. Environmental Protection Agency, along with the increase in the number of 4-stroke and new cleaner 2-stroke engines in modern snowmobiles has and will continue to reduce the potential impacts on the environment described in the literature review. The increased presence of a law enforcement officer and zone officer would ensure stipulations that support the compatibility of this use. Therefore, snowmobiling on Sunkhaze Meadows NWR poses only a minimal threat to goals 3 ("Promote the biological integrity, diversity, and environmental health of the Sunkhaze Meadows Unit's wetland, forest, and aquatic habitats to protect water quality and sustain native plant communities, rare plants, and wildlife, including species of conservation concern," and "Provide grassland, shrubland and aquatic habitats at Benton and Sandy Stream Units to sustain a diversity of wildlife, including species of conservation concern") as written in the comprehensive conservation plan (CCP). Our continued monitoring of the effects of snowmobiling is necessary to understand better their impacts on refuge habitats, plant and wildlife communities, and human visitors. Monitoring would identify any actions needed to respond to new information and correct problems that may arise in the future.

Snowmobile trails on the refuge provide an important link in the State trail system, enhance opportunities for the public to experience the winter landscape, and facilitate priority public uses. It would potentially benefit goal 4 and 6 ("Promote enjoyment and environmental stewardship by engaging visitors, students, and nearby residents to experience the wetlands, woods, and wildlife at Sunkhaze Meadows Unit," and "Promote enjoyment and environmental stewardship by engaging visitors, students, and nearby residents to experience the wetlands, woods, and wildlife at the Benton and Sandy Stream Units") of the CCP by providing opportunities during winter months for wildlife observation and photography and access for hunting.

PUBLIC REVIEW AND COMMENT:

As part of the CCP process for Sunkhaze Meadows NWR and Carlton Pond Waterfowl Production Area, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible ___x___

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Snowmobile clubs must continue to operate within the terms of the SUP issued to them every year.

- Snowmobiles would only be permitted on designated trails (maps B.22, B.23, and B.25)

- Snowmobile trails would only be open for use when all areas of the trail have generally contiguous snow cover.

- All trails would be located on existing roadbeds, wherever possible, to minimize vegetation damage. Trails would also be kept away from streams to avoid erosion. Where stream crossings are unavoidable, sighting and construction of bridges or culverts would follow best management practices, and crossing structures would be maintained in good repair.

- Trails would be located away from areas of unique or sensitive vegetation, such as bogs or wetlands.

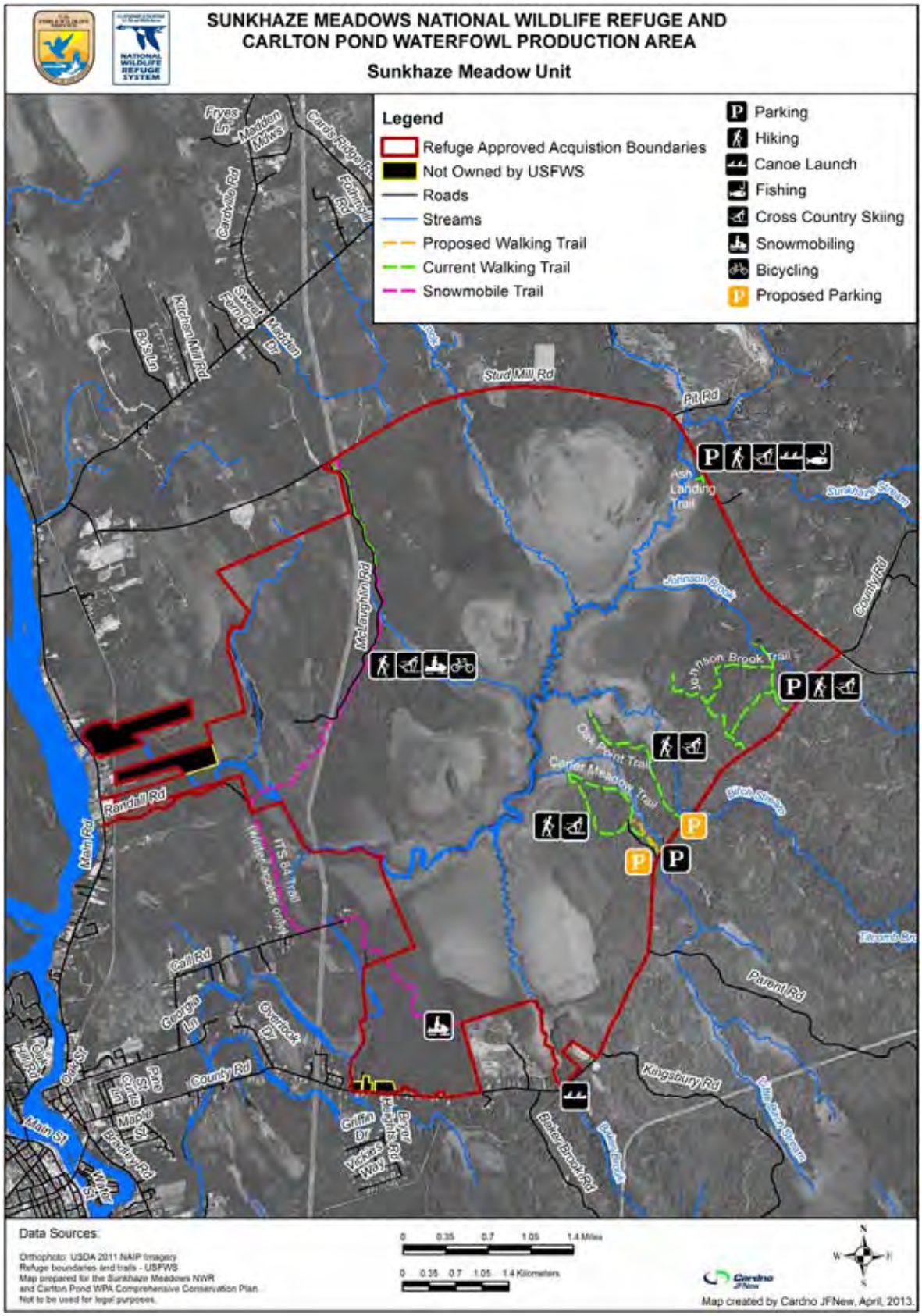
- Snowmobile trails would be located so that they are away from deer wintering areas and do not run between deer bedding and feeding areas. Trails are also located in upland deciduous forest, and would be kept out of drainage bottoms and coniferous riparian areas important for wildlife such as fisher, marten, and moose, wherever possible.

- All trails would be surveyed for signs of wildlife activity, sensitive vegetation, or erosion potential, and trail locations would be entered into a geographic information system. We would use that information to guide routing, re-routing, or closure of trails. Biological inventories would continue to provide baseline information for measuring change. Should the monitoring and evaluation of the use indicate that the compatibility criteria have or would be exceeded, appropriate action would be taken to ensure continued compatibility, including modifying or discontinuing the use.

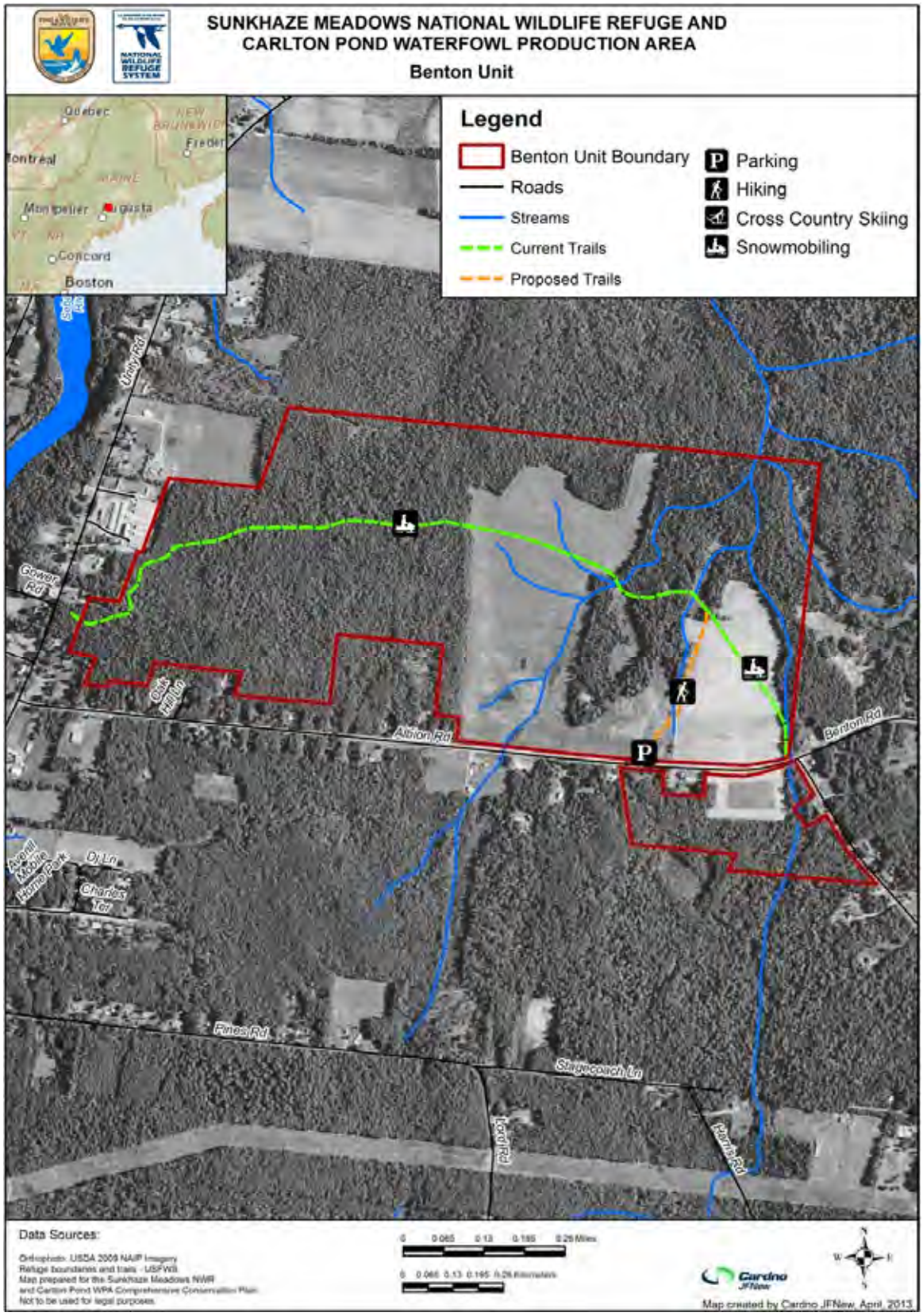
- The refuge would institute a public outreach program (brochures, signs) when funding is available to help educate the public about refuge regulations, safety, and how to minimize disturbance of wildlife.

- Routine law enforcement patrols would be conducted throughout the year to promote compliance with refuge regulations and provide educational outreach, help monitor public use patterns, public safety, and document visitor interactions. Refuge officers may record visitor numbers, vehicle numbers, visitor activities, and locations of the activities to document current and future levels of refuge use. Conditions that are a risk to public safety would be identified, and appropriate action would be promptly taken to correct such conditions.

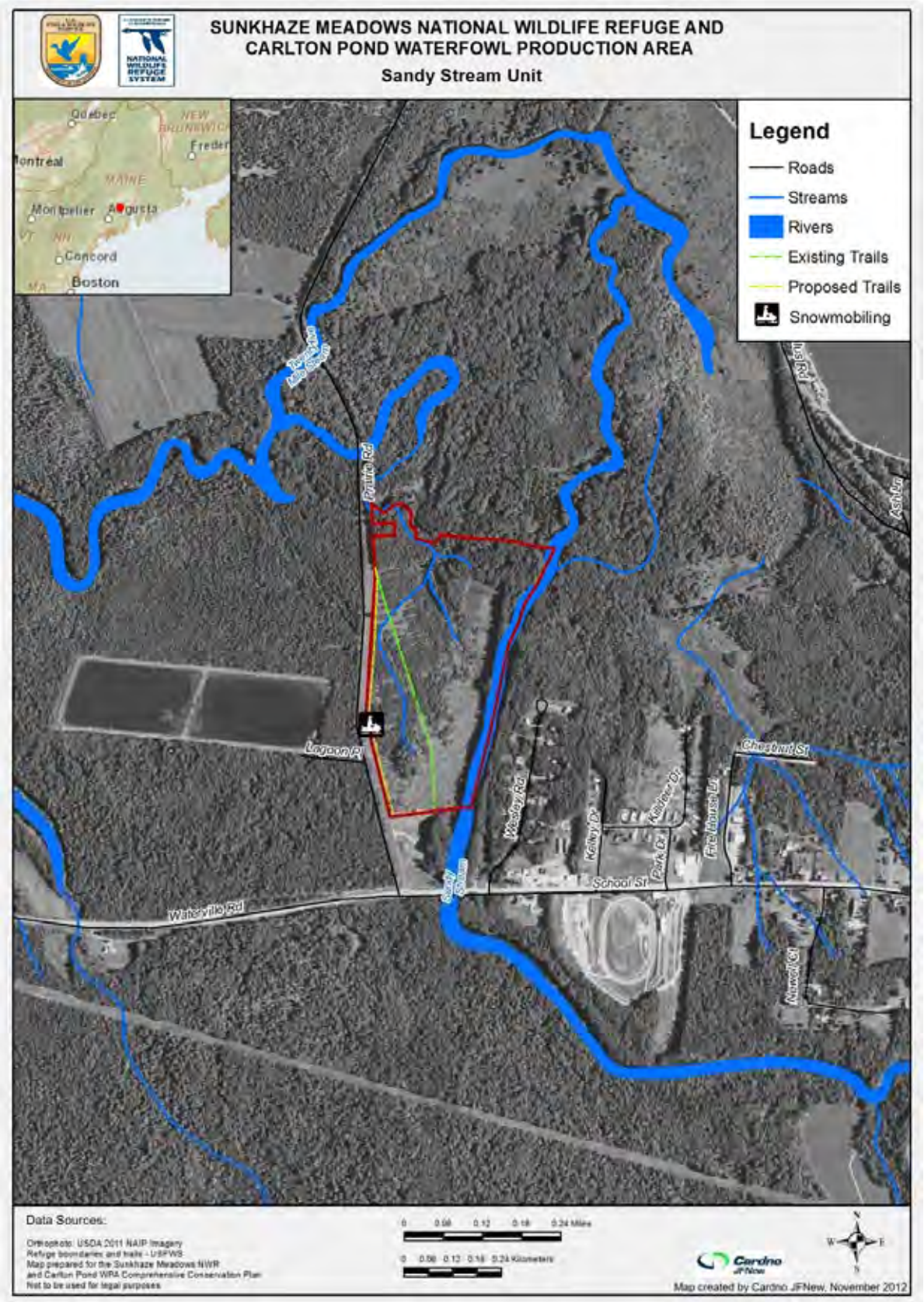
Map B.22. Sunkhaze Meadows Unit Infrastructure, including snowmobiling.



Map B.23. Benton Unit Infrastructure, including snowmobiling.



Map B.24. Sandy Stream Unit Infrastructure, including snowmobiling.



JUSTIFICATION:

This is an existing use of the refuge. This use is consistent with the Service's environmental assessment prepared for the refuge's establishment where we stated that we would continue to allow this use if compatible (USFWS 1988, pg. 5). Allowing snowmobiling at Sunkhaze NWR, as stipulated in this document, would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the refuge was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes. As discussed under the section on anticipated impacts above, the short portion of the trail that crosses the Sunkhaze Meadows Unit passes through a forested upland type habitat. Relocation of the trail to off-refuge lands would require substantial effort and expense, and would undoubtedly result in greater impacts on wetlands than the existing trail, which impacts no wetlands in the vicinity of the refuge. Adverse impacts to soils and vegetation from this use are minimized during winter months since snowmobiling is limited to established trails and the ground is often frozen. Adverse impacts on wildlife are minimized because fewer species and fewer numbers of wildlife are present during winter months when most of this use occurs. In addition, snowmobile trails throughout these areas have been established for many years and pre-date Service ownership. Because the wildlife potentially affected are accustomed to that use, we consider impacts on wildlife minimal. This use has been allowed on the refuge since the refuge was established with no significant adverse effects observed.

Snowmobiling would not materially interfere with or detract from the endangered species aspect of the refuge's purposes, because there are no federally listed threatened or endangered species known to occur on the refuge. This activity would not materially interfere with or detract from the mission of the Refuge System, because of the limited impacts to refuge resources, because it facilitates priority public uses, and because of the stipulations specified above. For all of these reasons, we have determined that this use, as stipulated, is consistent with the wildlife and habitat aspects of the refuge's purposes, the Service policy on compatible uses, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Aasheim, R. 1980. Snowmobile impacts on the natural environment. *In*: Andrews, R.N.L. and P.F. Nowak, eds., Off-road vehicle use: a management challenge. U.S. Department of Agriculture, Office of Environmental Quality, Washington, DC. 348 p.

Adams, E.S. 1975. Effects of lead and hydrocarbons from snowmobile exhaust on brook trout (*Salvelinus frontinalis*). Transactions of the American Fisheries Society 2:363-373.

Bishop, G.A., J.A. Morris, and D.H. Stedman. 2001. Snowmobile contributions to mobile source emissions in Yellowstone National Park. Environmental Science & Technology 35(14):2874-2881.

Boucher, J., and T.A. Tattar. 1975. Snowmobile impact on vegetation. Forest Notes 121:27-28

Bowles, A.E. 1995. Responses of wildlife to noise. *In*: R.L. Knight and K.J. Gutzwiller, eds., Wildlife and recreationists: coexistence through management and research. Island Press, Washington, DC. 372 p.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation.

Butler, J.R. 1984. The myths, the reality, and the challenges of managing for the non-consumptive wildlife user. In W.C. McComb, editor and compiler. Proceedings of the Workshop on Management of Nongame Species and Ecological Communities. University of Kentucky, Department of Forestry, Lexington, Kentucky. 404 pp.

Carlson, L.H., and P.J. Godfrey. 1989. Human impact management in a coastal recreation and natural area. Biological Conservation.

Cassirer, E.F., D.J. Freddy, and E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. Wilderness Management.

Colescott, J.H., and M.P. Gillingham. 1998. Reaction of moose (*Alces alces*) to snowmobile traffic in the Greys river valley, Wyoming. Alces 34(2):329-338.

Creel, S., J.E. Fox, A. Hardy, J. Sands, B. Garrott, and R.O. Peterson. 2002 snowmobile activity and glucocorticoid stress responses in wolves and elk. Conservation Biology 16(3):809-814.

Crete, M., and S. Lariviere. 2003. Estimating the costs of locomotion in snow for coyotes. Canadian Journal of Zoology 81:1808-1814.

Dearden, P., and C. Hall. 1983. Non-consumptive recreation pressures and the case of the Vancouver Island marmot (*Marmota vancouverensis*). Environmental Conservation.

Dorrance, M.J., P.J. Savage, and D.E. Huff. 1975. Effects of snowmobiles on white-tailed deer. Journal of Wildlife Management 39(3):563-569.

Eckstein, R.G., T.F. O'Brien, O.J. Rongstad, and J.G. Bollinger. 1979. Snowmobile effects on movements of white-tailed deer: a case-study. Environmental Conservation 6(1):45-51.

Ferguson, M.A.D., and L.B. Keith. 1982. Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. Canadian Field-Naturalist.

Foresman, C.L., D.K. Ryerson, R.N. Walejko, W.H. Paulson, and J.W. Pendleton. 1976. Effect of snowmobile traffic on bluegrass (*Poa pratensis*). Journal of Environmental Quality 5(2):129-133.

Freddy, D. J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and snowmobiles. Wildlife Society Bulletin 14:63-68.

Goff, G.R., D.J. Decker, and G. Pomerantz. 1988. A diagnostic tool for analyzing visitor impacts on wildlife refuges: a basis for a systematic approach to visitor management. Transactions of Northeast Section of the Wildlife Society.

Goodrich, J.M., and J. Berger. 1994. Winter recreation and hibernating black bears *Ursus americanus.* Biological Conservation 67:105-110

Hall, D., and P. Dearden. 1984. The impact of non-consumptive recreation on wildlife: an annotated bibliography.

Hammitt, W.E., and D.N. Cole. 1998. Wildland recreation: ecology and management. 2nd Ed. John Wiley & Sons, New York. 361 p.

Huff, D.E., and P.J. Savage. 1972. A correlation of deer movements with snowmobile activity in Minnesota during winter. Proceedings of the Midwest Fish & Wildlife Conference 34:42.

Jarvinen, J.A., and W.D. Schmid. 1971. Snowmobile use and winter mortality of small mammals. *In*: Proceedings of the 1971 snowmobile and off the road vehicle research symposium. Tech. Rep. 8. Recreation Research and Planning Unit, Department of Park & Recreation Resources, Michigan State University, East Lansing, Michigan. 196 p.

Keddy, P.A., A.J. Spavold, and C.J. Keddy. 1979. Snowmobile impact on old field and marsh vegetation in Nova Scotia, Canada: an experimental study. Environmental Management 3(5):409-415.

Klein, M.L. 1989. Effects of high levels of human visitation on foraging waterbirds at J.N. Ding Darling National Wildlife Refuge. Final research report.

Knight, R.L., and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. *In:* Glinski, R.L., B.G. Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, S.W. Hoffman, C.E. Ruibal, D.L. Krahe, D.L. Owens eds., Proceedings of the southwest raptor management symposium and workshop.

Knight, R.L., and D.N. Cole. 1995. Factors that influence wildlife responses to recreationists, *In*: R.L. Knight and K.J. Gutzwiller, eds., Wildlife and recreationists: coexistence through management and research. Island Press, Washington, DC. 372 p.

Kuss, F.R., and A.R. Graefe. 1985. Effects of recreation trampling on natural area vegetation. Journal of Leisure Research.

Marion, J.L., and D.W. Lime. 1986. Recreational resource impacts: visitor perceptions and management responses. In: Kulhavy, D.L. and R.N. Conner eds., Wilderness and natural areas in the Eastern United States: a management challenge.

Moen, A.N. 1976. Energy conservation by white-tailed deer in the winter. Ecology 57:192-198.

Moen, A.N., S. Whittemore, and B. Buxton. 1982. Effects of disturbance by snowmobiles on heart rate of captive white-tailed deer. New York Fish & Game Journal 29(2):176-183.

More, T.A. 1979. The demand for nonconsumptive wildlife uses: a review of the literature.

Neumann, P.W., and H.G. Merriam. 1972. Ecological effects of snowmobiles. Canadian Field-Naturalist 86:207-212.

Ollif, T., K. Legg, and B. Kaeding, eds. 1999. Effects of winter recreation on wildlife of the Greater Yellowstone Area: a literature review and assessment. Rept. to the Greater Yellowstone Coordinating Committee. Yellowstone National Park, Wyoming. 315 p.

Pesant, A.R., C. Fernet, L. Belzile, and J.L. Dionne. 1985. Effects of snowmobile traffic on yield and botanical composition of forage stands in Quebec. Canadian Journal of Plant Science 65:543-552.

Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, and N.A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges.

Richens, V.B., and G.R. Lavigne. 1978. Response of white-tailed deer to snowmobiles and snowmobile trails in Maine. Canadian Field-Naturalist 92(4):334-344.

Severinghaus, C.W., and B.F. Tullar. 1978. Wintering deer versus snowmobiles. New York Department of Environmental Conservation.

U.S. Fish and Wildlife Service (USFWS). 1988. Final Environmental Assessment: Proposal to Establish Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine.

August 1988. U.S. Department of the Interior Fish and Wildlife Service Region 5. Newton Corner, Massachusetts. 56 pp.

——— 1992. Sunkhaze Meadows National Wildlife Refuge preliminary station management plan.

——— 1993. Sunkhaze Meadows National Wildlife Refuge annual narratives 1989-1993. Unpublished reports in refuge files.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

U.S. GAO. 2000. Report to congressional requesters: federal lands: agencies need to assess the impact of personal watercraft and snowmobile use. GAO/RCED-00-243. U.S. General Accounting Office, Washington, DC. 85 p.

Van der Zande, A.N., J.C. Berkhuizen, H.C. Van Latesteijn, W.J. Ter Keurs, and A.J. Poppelaars. 1984. Impact of outdoor recreation on the density of a number of breeding bird species in woods adjacent to urban residential areas. Biological Conservation.

Wanek, W.J. 1971. Snowmobiling impact on vegetation, temperatures, and soil microbes. *In*: Proceedings of the 1971 snowmobile and off the road vehicle research symposium. Tech. Rep. 8. Recreation Research and Planning Unit, Department of Park & Recreation Resources, Michigan State University, East Lansing, Michigan. 196 p.

——— 1974. The ecological impact of snowmobiling in northern Minnesota. *In*: Proceedings of the 1973 snowmobile and off the road vehicle research symposium. Tech. Rep. 9. Recreation Research and Planning Unit, Department of Park & Recreation Resources, Michigan State University, East Lansing, Michigan. 202 p.

White, P.J., T. Davis, and J. Borkowski. 2004. Wildlife responses to winter recreation in Yellowstone National Park, 2004 annual report. National Park Service. 48 p.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area

Use: Research conducted by non-Service personnel

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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_X_**

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 allow

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Research conducted by non-Service personnel

Narrative

Research by non-U.S. Fish and Wildlife Service (Service) personnel is conducted by colleges, universities, Federal, State, and local agencies, non-governmental organizations, and qualified members of the general public to further the understanding of the natural environment and to improve the management of Sunkhaze Meadows National Wildlife Refuge (NWR, refuge) and Carlton Pond Waterfowl Production Area's (WPA) natural resources. Much of the information generated by the research is applicable to management on and near the refuge. 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 partners can access equipment and facilities unavailable to refuge staff for analysis of data or biological samples. This use is therefore beneficial to the refuge and WPA's natural and cultural resources.

Research conducted by non-Service personnel would also enable the refuge to better achieve the first goal of the draft Comprehensive Conservation Plan (Promote the biological integrity, diversity, and environmental health of the Sunkhaze Meadow Unit's wetland, forest, and aquatic habitats to protect water quality and sustain native plant communities, rare plants, and wildlife, including species of conservation concern) because these data would help the refuge staff make informed decisions. In addition, because this use could aid in the protection of fish and wildlife resources, it promotes the fulfillment of the refuge purpose of protecting fish and wildlife resources (Fish and Wildlife Act of 1956; 16 U.S.C. 742f (a) (4)). Research purposes fits into the description of 603 FW1 1.10(D), Specialized Uses. Specifically, research with partners is actively encouraged under 1.10 (D)(4).

The Service would encourage and support research and management studies on refuge lands that would improve and strengthen natural resource management decisions. The refuge manager would encourage and seek research relative to approved refuge objectives that clearly improves land management and promotes adaptive management. Priority research addresses information that would better manage the Nation's biological resources; is generally considered important to agencies of the Department of the Interior, the Service, the National Wildlife Refuge System, and State fish and game agencies; and that addresses important management issues or demonstrates techniques for management of species or habitats.

Refuge staff would also consider research for other purposes that may not be directly related to refuge-specific objectives, but contribute to the broader enhancement, protection, use, preservation, and management of native populations of fish, wildlife, and plants, and their natural diversity within the region or flyway. These proposals must 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- or WPA-specific stipulations set forth in the required 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 and WPA's natural and cultural resources and it is consistent with the goals and objectives of the draft CCP (USFWS 2013).

Reference

U.S. Fish and Wildlife Service (USFWS). 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. March 2012. 700 pp.

COMPATIBILITY DETERMINATION

USE: Research conducted by non-Service personnel

REFUGE NAME: Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area

DATE ESTABLISHED:

Sunkhaze Meadows National Wildlife Refuge:
November 22, 1988

Carlton Pond Waterfowl Production Area:
November 24, 1965

ESTABLISHING AUTHORITIES:

Sunkaze Meadows National Wildlife Refuge:

1. Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)

2. Refuge Recreation Act of 1962 (16 U.S.C. 460k-406k-4; 76 Stat. 653)

Carlton Pond Waterfowl Production Area:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

Sunkaze Meadows National Wildlife Refuge:

1. "... or the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4)) "...for the benefit of the United States Fish and Wildlife Service, in performing it activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." ((16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956))

2. "... suitable for -- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." ((16 U.S.C. 460k-1) (Refuge Recreation Act))

Carlton Pond Waterfowl Production Area:

1. "…as Waterfowl Production Areas" subject to "...all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" (16 U.S.C.718c (Migratory Bird Hunting and Conservation Stamp Act))

2. "…for any other management purpose, for migratory birds." (16 U.S.C. 715d (Migratory Bird Conservation Act))

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is research conducted by non-Service personnel. Research conducted by non-Service personnel is not a priority public use of the National Wildlife 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?
The location of the research would vary depending on the individual research project that is being conducted. The entire refuge is open and available for scientific research. An individual research project is usually limited to a particular habitat type, plant or wildlife species. On occasion research projects would encompass an assemblage of habitat types, plants or wildlife. The research location would be limited to those areas of the refuge and Waterfowl Production Area (WPA) that are absolutely necessary to conduct the research project.

(c) When would the use be conducted?
The timing of the research would depend entirely on the individual research project that is being conducted. Scientific research would be allowed to occur on the refuge throughout the year. An individual research project could be short term in design, requiring one or two visits over the course of a few days. Other research projects could be multiple year studies that require daily visits to the study site. The timing of each individual research project would be limited to the minimum required to complete the project. If a research project occurs during the refuge hunting season, special precautions would be required and enforced to ensure public health and safety.

(d) How would the use be conducted?
The mechanics of the research would depend entirely on the individual research project that is conducted. The objectives, methods, and approach of each research project would be carefully scrutinized before it would be allowed to occur on the refuge or the WPA. No research project would be allowed to occur if it does not have an approved study plan and protocol or if it compromises public health and safety, or if it is not found appropriate (see below).

In general, we would allow observational research projects (bird banding, bird counts, fur collection from scratching posts, etc.) that do not cause mortality to birds and animals, or involve major manipulations of the ecosystem. Where collecting would be allowed, it would be a critical part of the research, would not involve the collection of threatened or endangered species, and would be carefully restricted to levels not expected to impair populations. For example, over the past 2 years, the students of several local high schools, in conjunction with the Schoodic Education and Research Center, have been doing research on the movement of mercury through the aquatic food chain. Under a special use permit (SUP), they have been allowed to collect a

limited number of dragonfly larvae for analysis from specific areas. Part of the study also compared the mercury loads of dragonfly larvae collected at the refuge with levels of those collected elsewhere. This was useful information of interest to the refuge and other Service staff.

Researchers participating in approved studies are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing). Carlton Pond WPA does not currently have any walking trails, so access to the water is allowed via walking off-trail or through the use of motorized and non-motorized boats.

(e) Why is this use being proposed?
Research by non-Service personnel is conducted by colleges, universities, Federal, State, and local agencies, non-governmental organizations, and qualified members of the general public to further the understanding of the natural environment and to improve the management of the refuge's natural resources. Much of the information generated by the research is applicable to management on and near the refuge and WPA. The Service encourages and supports research and management studies on refuge lands that would improve and strengthen natural resource management decisions.

The refuge manager encourages and seeks research relative to approved refuge objectives that clearly improves habitat management and promotes adaptive management. Priority research addresses information that would better manage the Nation's biological resources and are generally considered important to: Agencies of the Department of the Interior; the U.S. Fish and Wildlife Service; the National Wildlife Refuge System; and state fish and wildlife agencies, and that address important management issues or demonstrate techniques for management of species or habitats. The refuge also considers research for other purposes which may not be directly related to refuge specific objectives, but contributes to the broader enhancement, protection, use, preservation and management of native populations of fish, wildlife and plants, and their natural diversity within the region or flyway. These proposals must comply with the Service's compatibility policy. Refuge support of research directly related to refuge 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.

Both the Refuge Manual and the Service Manual provide guidance on allowing research on refuges. The Refuge Manual (4 RM 6.2) lists three objectives that can be met by permitting research on refuges:

1) Promoting new information which will improve the quality of the refuge and other Service management decisions.

2) To expand the body of scientific knowledge about fish and wildlife, their habitats, the use of these resources, appropriate resource management and the environment in general.

3) To provide the opportunity for students and others to learn the principles of field research.

The Service Manual (603 FW 1.10D (4)) provides supplemental guidance in terms of the appropriateness of research on refuges, as follows: "We actively encourage cooperative natural

and cultural research activities that address our management needs. We also encourage research related to the management of priority general public uses. Such research activities are generally appropriate. However, we must review all research activities to decide if they are appropriate or not as defined in section 1.11. Research that directly benefits refuge management has priority over other research."

The rationale for this conclusion is clearly stated in the preamble to that policy (71 Federal Regulation 36415):

> Not all research may be appropriate. Some research may affect fish, wildlife, and plants in a manner neither consistent with refuge management plans nor compatible with refuge purposes or the Refuge System mission. Some research may interfere with or preclude refuge management activities, appropriate off the refuge, appropriate and compatible public uses, or other research. Some research may be appropriate off the refuge, but not on the refuge. For example, some natural and physical research may not be wildlife-dependent and may be accomplished successfully at locations off the refuge. Because not all research support establishing purposes of refuges or the Refuge System mission, we cannot define research as a refuge management activity.

AVAILABLITY OF RESOURCES:

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 one 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 on site visits.

Annual costs associated with the administration of outside research on the refuge and WPA are estimated below:

Refuge biologist (GS11) (review proposals, coordinate with researchers) 2 days/yr:	$672
Administrative Assistant (GS7) (SUP preparation and administration) 1 day/yr:	$168
Total:	**$840**

ANTICIPATED IMPACTS OF THE USE:

The Service encourages approved research to further the understanding of the natural resources. Research by other than Service personnel adds greatly to the information base for refuge managers to make proper decisions. Disturbance to wildlife and vegetation by researchers could occur through observation, banding, collecting blood, and accessing the study area by foot, boat, or vehicle. These impacts could be exacerbated by multiple concurrent research projects. It is possible that direct mortality could result as a by-product of research activities. Overall, however, allowing research to be conducted by non-Service personnel should have little impact on Service interests. If the research project is conducted with professionalism and integrity, the knowledge gained far outweighs potential adverse impacts.

Research conducted by non-Service personnel on Sunkhaze Meadows NWR and Carlton Pond WPA poses only a minimal threat to refuge resources because the refuge manager can control the potential for adverse impacts through SUPs, prohibiting multiple research projects from affecting any given area or species at one time. Refuge managers retain the option to prohibit research on the refuge or WPA which does not contribute to the mission of the refuge system or causes undue disturbance or harm. Managers retain the right to revoke or deny renewal for any SUP if unanticipated short-term, long-term, or cumulative impacts are noted.

Ideally, any research project conducted on the refuge would positively contribute to one or more of the refuge goals and/or objectives and may assist in achieving goals 1, 2, and 3 of the refuge's and WPA's draft comprehensive conservation plan (USFWS 2013). There may be short-term disturbance to plants and wildlife during field investigations—this is unavoidable in most cases. Any threats would be mitigated by the stipulations required under this compatibility determination and any additional conditions specified under each SUP.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond WPA, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- All researchers would be required to submit a detailed research proposal per 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. If collection of wildlife is involved, the refuge must be given 60 days to review the proposal.

- The regional refuge biologists, other Service Divisions, State agencies, academic experts, may be asked to review and comment on proposals.

- Proposals would be prioritized and approved based on need, benefit to refuge resources and the Refuge System, compatibility, and funding required.

- Researchers would be expected to submit a final report to the refuge, on completion of their work. For long-term studies, interim progress reports may also be required. The refuge also expects that research would be published in peer-reviewed publications.

- The contribution of the refuge and the Service would need to be acknowledged in any publications.

- SUPs would be required for all research conducted by non-Service personnel. The SUP would list all conditions that are necessary to ensure compatibility. These permits would also identify a schedule for annual progress reports and the submittal of a final report or scientific paper.

- All researchers would be required to obtain appropriate State and Federal collecting or other permits and submit copies if requested to refuge staff prior to the commencement of any approved research on the refuge

- Researchers would be required to take steps specified by Service staff in the SUPs to ensure that invasive species and pathogens are not inadvertently introduced or transferred to Sunkhaze Meadows NWR or Carlton Pond WPA.

JUSTIFICATION:

We have determined that allowing research by non-Service personnel on the refuge and WPA would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System or the purposes for which the refuge was established. In fact, based on the analysis presented above, we have determined that it would contribute to the mission of the National Wildlife Refuge System and the purposes for which the refuge was established. Research by non-Service personnel is conducted by colleges, universities, Federal, State, and local agencies, non-governmental organizations, and qualified members of the general public to further the understanding of the natural environment and to improve the management of the refuge's natural resources. Much of the information generated by the research is applicable to management on and near the refuge and WPA. The Service encourages and supports research and management studies on refuge lands that would improve and strengthen natural resource management decisions. This supports the wildlife and habitat aspects of the purposes for which the refuge and WPA were established and the mission of the National Wildlife Refuge System.

Signature: Refuge Manager: _____
(Signature/Date)

Concurrence: Regional Chief: _____
(Signature/Date)

Mandatory 10-year Reevaluation Date: _____

BIBLIOGRAPHY

U.S. Fish and Wildlife Service. 1985. Refuge Manual. Washington, DC: U.S. Government Printing Office.

COMPATIBILITY DETERMINATION

USE: Wildlife Observation and Photography, Environmental Education and Interpretation

REFUGE NAME: Carlton Pond Waterfowl Production Area

DATE ESTABLISHED: November 24, 1965

ESTABLISHING AUTHORITIES:
Carlton Pond Waterfowl Production Area (WPA) was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965. It was established under the following legislative authorities:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "…as Waterfowl Production Areas" subject to "…all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" ((16 U.S.C.718c) (Migratory Bird Hunting and Conservation Stamp Act)).

2. "…for any other management purpose, for migratory birds." ((16 U.S.C. 715d) (Migratory Bird Conservation Act)).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resource and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What are the uses? Are they priority public uses?
The uses are wildlife observation, photography, environmental education, and interpretation. These four uses are among the six priority public uses of the National Wildlife 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 uses be conducted?
Wildlife observation, photography, environmental education and interpretation would be allowed to occur throughout the Carlton Pond Waterfowl Production Area (WPA) during open hours. No designated trails or photo blinds exist or are planned on the area; most visitors use canoes or

kayaks to access the WPA, and opportunities for observation and photography occur on the adjacent road and access point as well as from a canoe, kayak or other boat on the water. The exact locations of environmental education and interpretation activities would be at the discretion of the refuge manager through required special use permit (SUP).

(c) When would the uses be conducted?

Wildlife observation, photography, environmental education, and interpretation would be allowed on the WPA daily, year-round, from sunrise to sunset, unless a conflict with a management activity or an extenuating circumstance necessitates deviating from this. Closures for snow or ice storms, or other events affecting human safety, or for nesting season and other sensitive times of the year are examples that might require these uses be temporarily suspended or require temporary spatial closures of certain areas.

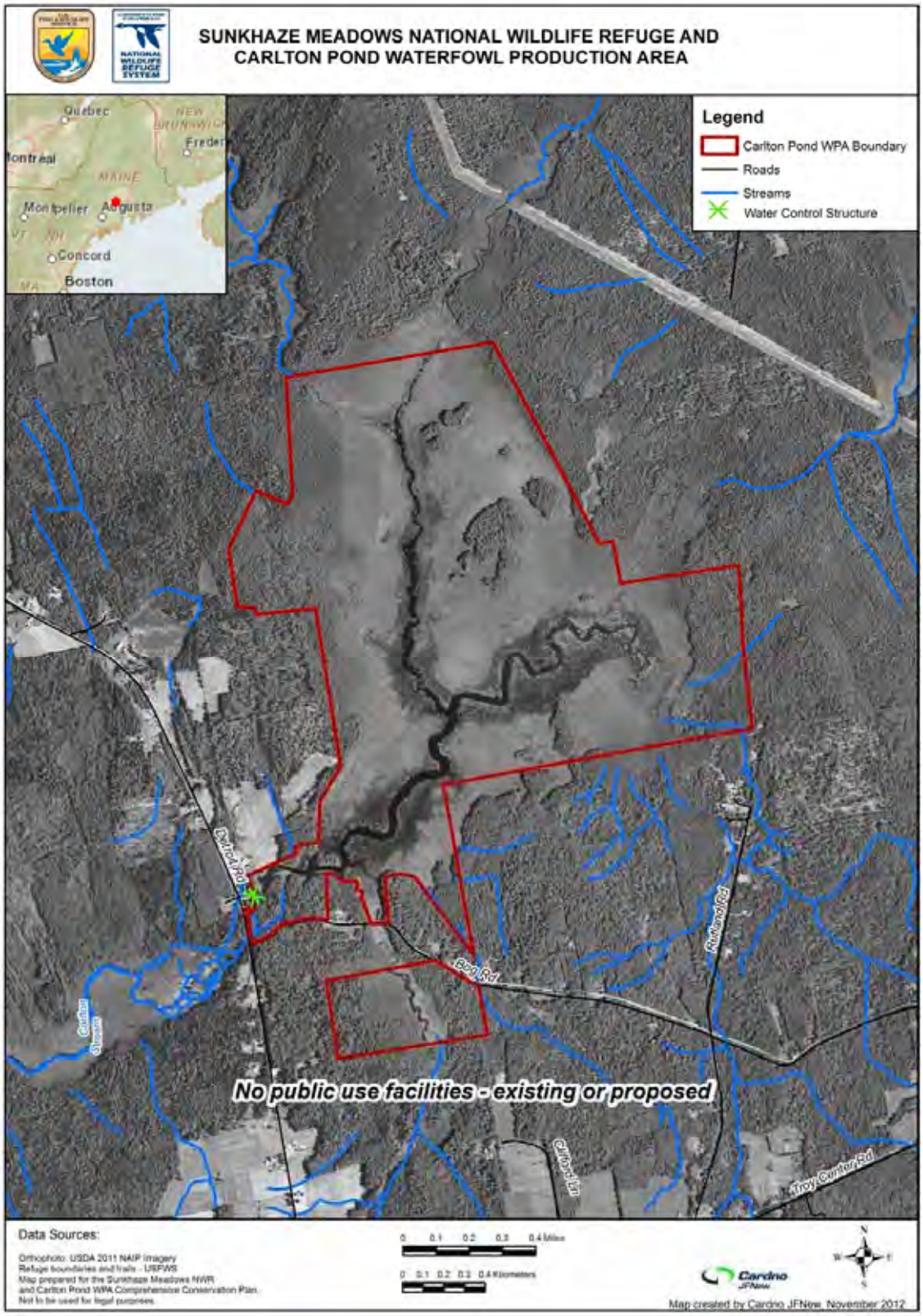
(d) How would the uses be conducted?

Refuge staff would be responsible to provide law enforcement; maintain boundaries and signs; meet with and/or respond to inquiries by adjacent landowners and interested public; recruit and supervise volunteers; prepare information on these uses to be delivered via websites, brochures, and other means; develop necessary signage; monitor and evaluate impacts; regulate the use of the area by groups larger than 10 through SUPs (for example, limiting an environmental education canoe program to one class of 30 on a given day) ; and, if sufficient staff exists, prepare and deliver environmental education and/or interpretation programs. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (i.e., walking).

(e) Why are these use(s) being proposed?

Wildlife observation, wildlife photography, environmental education, and interpretation are Priority Public Uses as defined by 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). If compatible, they are to be facilitated on refuges. These uses would be conducted to provide compatible educational and recreational opportunities for visitors to enjoy the resources and to gain understanding and appreciation for fish and wildlife and habitats, ecology and wildlife management. These uses provide opportunities for visitors to relax and enjoy wildlife in a wholesome, safe, unstructured outdoor environment at their own pace, and to provide the psychological and health benefits attendant to that type of outdoor enjoyment. As visitors enjoy the recreational aspects of these activities, they may be drawn to engage in the more structured educational opportunities offered, and thereby enhance their understanding of natural resource management programs and ecological concepts. This, in turn, would enable them to better understand ecological issues and problems affecting refuge resources and become better advocates and stewards for those resources. Photographs that are taken on refuges are sometimes shared with others by the photographer or shared with the refuge staff and donated for use in U.S. Fish and Wildlife Service (Service) outreach materials and can provide the public increased exposure to refuge assets.

Map B.25. Service-owned Lands and Waters within Carlton Pond Waterfowl Production Area.



AVAILABILITY OF RESOURCES:

Sufficient refuge resources in terms of personnel and budget are available to administer these uses.

Cost Breakdown
The following are estimated costs to the refuge to administer and manage the refuge programs for wildlife observation, wildlife photography, environmental education, and interpretation.

Maintenance:	$500	annually to maintain water levels and dike
Install kiosk and signs:	$1,500	one-time expense
Monitoring:	$600	annually
Law Enforcement:	$1,000	annually
Total	**$3,600**	

ANTICIPATED IMPACTS OF THE USE:

Wildlife observation and photography, environmental education, and interpretation can have positive or negative impacts on the WPA's wildlife and habitats.

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. The positive impacts of these uses include providing visitors with a better appreciation 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 National Wildlife Refuge System, and the Service, as well as wildlife conservation in general.

The negative effects of these uses include impacts to plants, soils, hydrology, and wildlife from both visitors walking and hiking on the WPA and from building and maintaining public use facilities.

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. It is anticipated that allowing these uses could cause vegetation damage at boat put-in areas. However, these uses have been allowed at Carlton Pond WPA in the past and no significant damage has been observed.

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 will 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.

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 minor soil erosion would occur as a result of continuing pedestrian access on designated routes. Under current and anticipated levels of use, impacts to soils (erosion, compaction) are not likely to be significant, because this would be an ongoing use of the refuge, and refuge staff have not observed problems with soil erosion or compaction to date.

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.

Impacts to wet areas can occur when bridging is inadequate and visitors widen or go off the trail to avoid wet spots. Properly sited, designed, and maintained trails minimize this impact. Based on the current and projected levels of use, pedestrian travel is not likely to significantly increase erosion, incision, or stream alteration. This would be an ongoing use of the refuge, and refuge staff have not observed problems with erosion, incision, or stream alteration to date. Therefore, no significant hydrologic impacts are anticipated from this use.

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 Knight1998), 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.

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, could 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).

Specifically, at Carlton Pond WPA, spring or summer boating activity undertaken to observe or photograph wildlife may cause some disturbance to nesting waterfowl and shorebirds. The black tern, a State-listed endangered species, nests in the wetland vegetation near the water, so their nesting locations are monitored and water levels controlled for their benefit. In previous years, refuge staff have observed that most visitors avoid the areas where these and other waterfowl nest because of the emergent vegetation, mucky soils, and relatively shallow waters. These conditions make foot access and boat access somewhat difficult. Photographers and others would be notified with signs not to disturb these birds if needed. If disturbance becomes a productivity issue, the area close to their nests would be temporarily closed. Black ducks and other ground nesting birds are usually secreted away from areas traveled by boaters. In addition, wildlife observers and photographers generally seek to minimize disturbance as it interferes with their activity. Overall, effects should not be significant since the WPA experiences minimal public use and use is concentrated only at the launch site; there are no trails or buildings.

Summary of Impacts:
Based on observations and knowledge of the areas involved, there is no evidence that cumulatively, the proposed wildlife-dependent uses would have an unacceptable effect on the wildlife resource. Even before the establishment of the WPA, the landowners allowed the public to engage in these uses without discernible negative effects. Although a substantial increase in

the cumulative impacts from public use is not expected in the near term, it would be important for refuge staff to monitor use and respond, if necessary, to conserve the existing high quality wildlife resources.

No additional effects from wildlife observation, wildlife photography, environmental education, and interpretation are anticipated. Therefore allowing these uses poses only minimal threats to goal 2 of the CCP: "Provide open water and emergent wetland habitat at the Carlton Pond WPA to sustain a diversity of wildlife, including waterfowl and species of conservation concern." These uses help fulfill goal 5, to "Promote enjoyment and environmental stewardship by engaging visitors, students, and nearby residents to experience the wetlands, woods, and wildlife at the Carlton Pond WPA."

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond WPA, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Refuge staff would continue to monitor the WPA for the presence of threatened or endangered species, including the state-listed black terns, and ensure that unusual or critical conditions relative to habitat or disturbance are not present. If conditions dictate, uses of all or any part of the area may be temporarily suspended by posting appropriate signs.

- Periodic law enforcement would ensure compliance with regulations and area closures and discourage prohibited activities and vandalism.

- Outside individuals, groups or organizations wishing to visit the refuge to provide environmental education or interpretation activities would be required to obtain a SUP. This would allow the refuge staff to provide important information about access, resources, and specific stipulations to reduce disturbances that may be caused by groups compared to individuals. It would also help the refuge quantify and monitor these uses on the WPA.

JUSTIFICATION:

Wildlife observation, wildlife photography, environmental education, and interpretation are priority public uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife resources (Executive Order 12996, March 25, 1996, and The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997). The Service's policy is to provide opportunities for these uses when compatible and consistent with sound fish and wildlife management.

Allowing wildlife observation and photography, environmental education, and interpretation on Carlton Pond WPA would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the WPA was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes centered around migratory birds, focusing on waterfowl. These uses do not materially interfere with or detract from these purposes because: (1) these uses occur and are expected to remain at relatively low levels, and (2) at current and projected levels of use wildlife and habitats, including migratory birds, do not appear to be appreciably negatively affected by these uses. We have made this determination based on lack of observed habitat degradation, because disturbance to wildlife is expected to be short term, and these uses are concentrated in areas away from the sensitive nesting and feeding areas. Therefore, no significant adverse effects from wildlife observation, photography, and environmental education or interpretation are anticipated. In addition, allowing these uses supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013). These activities would not materially interfere with or detract from the mission of the Service, because providing these wildlife-dependent recreational opportunities is a focus of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 15-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male song sparrows. Animal Behavior 35:773-784.

Batten, L.A. 1977. Sailing on reservoirs and its effects on water birds. Biological Conservation 11:49-58.

Belanger, L. and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36-41.

Boyle, S.A. and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation.

——— 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123-130.

Burger, J. and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. Journal of Comparative Physiological Psychology 95:676-684.

——— 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. Environmental Conservation 22:56-65.

Butler, J.R. 1984. The myths, the reality, and the challenges of managing for the non-consumptive wildlife user. *In* W. C. McComb, editor and compiler. Proceedings of the Workshop on Management of Nongame Species and Ecological Communities. University of Kentucky, Department of Forestry, Lexington, Kentucky. 404 pp.

Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. American Birds 34: 206-208.

Carlson, L.H. and P.J. Godfrey. 1989. Human impact management in a coastal recreation and natural area. Biological Conservation.

Cassirer, E.F., D.J. Freddy, E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. In: Hendee, J.C., G.H. Stankey, R.C. Lucas. eds., Wilderness Management.

Cole, D.N. and P.B. Landres. 1995. Indirect effect of recreation on wildlife in Knight, R.L, and K.J. Gutzwiller, eds. 1995. Wildlife and Recreationists—Coexistence Through Management and Research. Washington, D.C. Island Press.

Dearden, P. and C.Hall. 1983. Non-consumptive recreation pressures and the case of the Vancouver Island marmot (Marmota vancouverensis). Environmental Conservation. Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation 18:39-51.

Ewald, P.W. and F.L Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31:277-292.

Ferguson, M.A.D. and L.B. Keith. 1982. Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. Canadian Field-Naturalist.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and in snowmobiles. Wildlife Society Bulletin 14:63-68.

Goff, G.R., D.J. Decker, G. Pomerantz. 1988. A diagnostic tool for analyzing visitor impacts on wildlife refuges: a basis for a systematic approach to visitor management. Transactions of the Northeast Section of the Wildlife Society.

Goodrich, J.M. and J. Berger. 1994. Winter recreation and hibernating black bears Ursus americanus. Biological Conservation. Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of human intrusion on song occurrence and singing consistence in subalpine birds. The Auk 111(1):28-37.

Hall, D. and P. Dearden. 1984. The impact of non-consumptive recreation on wildlife: an annotated bibliography.

Hammitt, W.E. and D.N. Cole. 1998. Wildland Recreation. John Wiley & Sons, New York, 361 pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Henson, P.T. and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin 19:248-257.

Kaiser, M.S. and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Klein, M.L. 1989. Effects of high levels of Human Visitation on Foraging Waterbirds at J.N. “Ding” Darling NWR, Sanibel, Florida. Final Report to USFWS. 103 pp.

——— 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9:1454-1465.

Knight, R.L. and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. In: Glinski, R.L., B.G. Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap,

S.W. Hoffman, C.E. Ruibal, D.L. Krahe, D.L. Owenseds., Proceedings of the southwest raptor management symposium and workshop.

Knight, R.L. and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Trans. 56th National Association of Wildlife and Natural Resources Conference. Pp. 238-247.

——— 1995. Wildlife responses to recreationists. Pp. 51-69 in: Knight, R.L. and K.J. Gutzwiller eds., Wildlife and recreationalists: coexistence through management and research. Island Press, Washington, D.C. 372 pp.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kuss, F.R. and A.R. Graefe. 1985. Effects of recreation trampling on natural area vegetation. Journal of Leisure Research.

Kuss. F. 1986. A review of major factors influencing plant responses to recreation impacts. Environmental Management. 10:638-650.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pp. 249-297 in: A. Sprunt IV, J.C. Ogden, and S. Winckler, eds., Wading Birds. National Audubon Society, New York, New York.

Marion, J.L. and D.W. Lime. 1986. Recreational resource impacts: visitor perceptions and management responses. In: Kulhavy, D.L. and R.N. Conner eds., Wilderness and natural areas in the Eastern United States: a management challenge.

McNeil, R., P. Drapeau, and J.D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. Biological Review 67:381-419.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

——— 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.

More, T.A. 1979. The demand for nonconsumptive wildlife uses: a review of the literature.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410 (also see corrigendum in Journal of Wildlife Management 54:683).

Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, N.A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges.Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130

Rodgers, J.A. and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

——— 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Trails and Wildlife Task Force. 1998. Planning trails with wildlife in mind: a handbook for trail planners. Colorado State Parks, Denver, CO. 51pp.

U.S. Fish and Wildlife Service (USFWS). 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

Van der Zande, A.N., J.C. Berkhuizen, H.C. Van Latesteijn, W.J. Ter Keurs, A.J. Poppelaars. 1984. Impact of outdoor recreation on the density of a number of breeding bird species in woods adjacent to urban residential areas. Biological Conservation.

Vaske, J.J., A.R. Graefe, and F.R. Kuss. 1983. Recreation impacts: a synthesis of ecological and social research. Transactions of the North American Wildlife and Natural Resource Conference 48:96-107.

Ward, D.H. and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D. and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J. and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

COMPATIBILITY DETERMINATION

USE: Fishing

REFUGE NAME: Carlton Pond Waterfowl Production Area

DATE ESTABLISHED: November 24, 1965

ESTABLISHING AUTHORITIES:
Carlton Pond Waterfowl Production Area (WPA) was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965. It was established under the following legislative authorities:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "…as Waterfowl Production Areas" subject to "…all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" ((16 U.S.C. 718c) (Migratory Bird Hunting and Conservation Stamp Act)).

2. "…for any other management purpose, for migratory birds." ((16 U.S.C. 715d) (Migratory Bird Conservation Act)).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is access to recreational fishing at Carlton Pond WPA. Public fishing is a priority public use of the National Wildlife Refuge System under 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?
The use would occur at Carlton Pond Waterfowl Production Area (WPA). Carlton Pond WPA is a shallow, artificial impoundment approximately 1,068 acres located in the town of Troy, Maine.

(c) When would the use be conducted?
The use would be conducted during the seasons specified in the fishing regulations of the State of Maine. Visitors would be allowed to access to Carlton Pond on foot through the refuge between sunrise and sunset, normal refuge open hours.

(d) How would the use be conducted?
Carlton Pond WPA is open to fishing in accordance with 50 CFR 32.4. Visitors participating in this approved public use are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking). Fishing may be conducted by boat or from the bank. Bank fishing may occur around the culvert on the Bog Road and near the dam. Fish species usually sought are pickerel, yellow perch, bullheads, and smallmouth and largemouth bass.

Refuge staff would continue to monitor the WPA for the presence of threatened or endangered species and ensure that unusual or critical conditions relative to habitat or wildlife are not present. If such conditions so dictate, uses of all or any part of the area may be temporarily suspended by posting in accordance with 50 CFR 31.16, 32.1, and 32.4. The refuge manager may, upon annual review of the fishing program, impose further restrictions on fishing or recommend that some or all fishing on the WPA be closed. We would restrict fishing if it becomes inconsistent with other, higher priority refuge programs or endangers WPA resources or public safety.

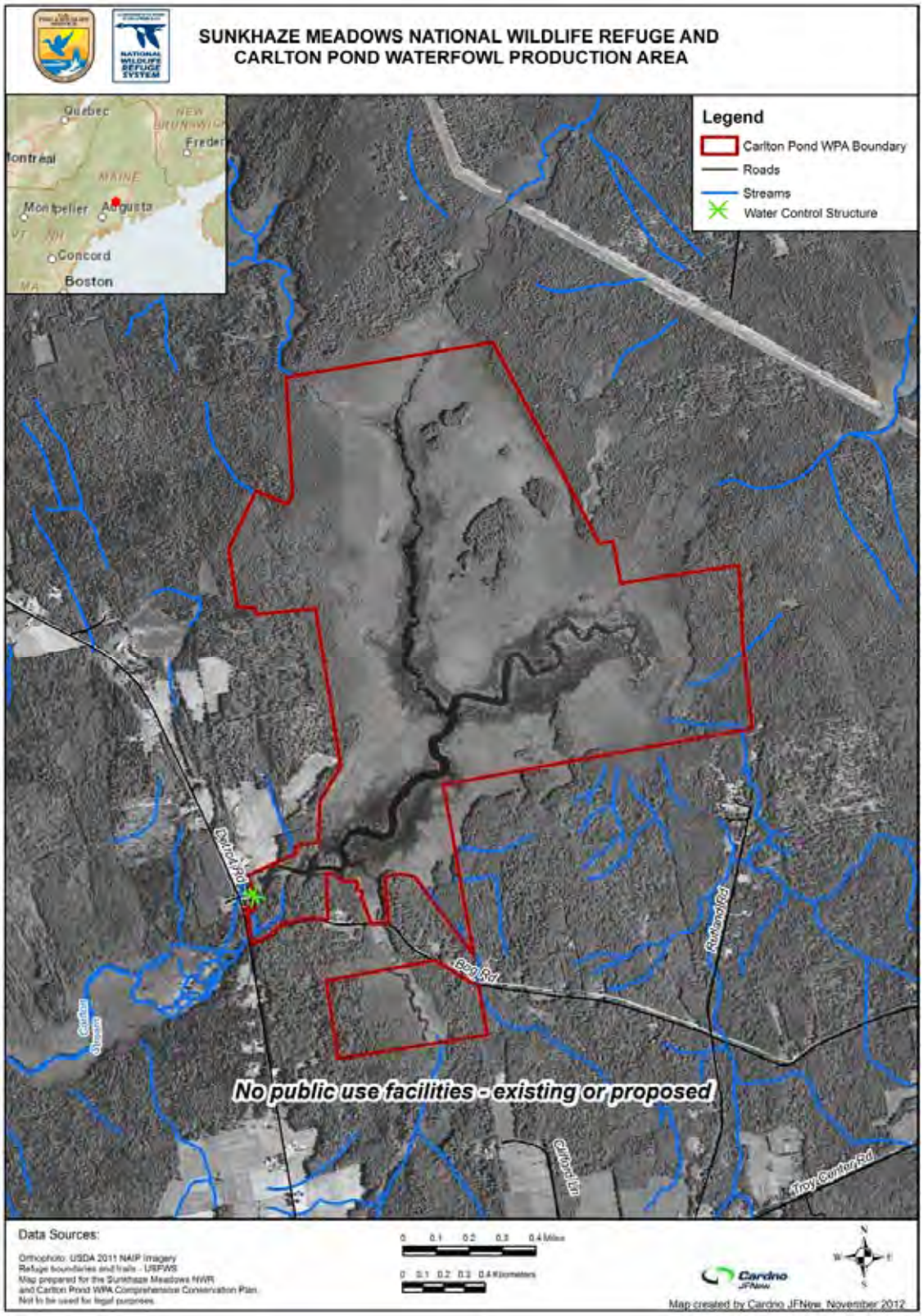
Fishing would be conducted under Maine State fishing regulations for open water and ice fishing, with some additional restrictions discussed below, to protect fish, wildlife, and habitat, and to reduce potential public use conflicts. A valid State of Maine fishing license would be required to fish on Carlton Pond WPA. Visitors fishing from boats would be required to comply with all conditions and stipulations in the WPA's compatibility determination for boating.

No fish of any species may be introduced into WPA waters without appropriate State and refuge permits. This includes unused bait fish and eggs. Bait fish may be trapped by State regulation from Carlton Pond's waters for personal use, but not for commercial purposes.

At the discretion of the refuge manager, some Service lands may be seasonally, temporarily, or permanently closed to fishing access, if wildlife or habitat impacts or user conflicts become an issue. In cooperation with State fisheries biologists, we may manipulate the fisheries and habitat to promote or improve the fishery resource, if warranted. That may include changing fishing regulations (season dates, creel limits, methods of take), introducing or removing fish barriers, and designating riparian buffers.

Additional specifics on how fishing would be implemented on the refuge are included in the refuge's public fishing plan. Staff are currently revising the plan, and intend to complete revisions within 5 years of CCP approval.

Map B.26. Service-owned Lands and Waters within Carlton Pond Waterfowl Production Area.



(e) Why is the use being proposed?
Carlton Pond WPA has been opened to fishing since its establishment in 1965. As stated previously, WPAs are open to fishing in accordance with 50 CFR 32.4. Fishing is also one of the priority uses of the Refuge System. The Service supports and encourages priority public uses on Service lands where appropriate and compatible. Fishing is also a traditional form of wildlife-oriented recreation. The 2011 national survey of fishing, hunting, and wildlife-associated recreation reveals that 341,000 Maine residents and nonresidents 16 years old and older participated in fishing (USFWS 2011).

AVAILABILITY OF RESOURCES:

Additional fiscal resources to conduct this activity would be minimal since Carlton Pond WPA has been opened to public fishing since its establishment in 1965, and would occur under State regulations and not as a refuge-regulated fishing program. Costs associated with administration of this use include:

Public Informational Signage:	$300
GS-9 Refuge Officer	
Law Enforcement/Outreach:	$1,000
Total:	**$1,300**

Based on a review of the budget allocated for public fishing management, we have determined that sufficient resources are available to continue the existing fishing program. Our existing staff and budget should provide sufficient resources to continue managing this activity.

ANTICIPATED IMPACTS OF THIS USE:

Fishing is consistent with the purposes of Carlton Pond WPA when it is carried out within established regulations and is a priority use of the Refuge System.

Impacts on Fish Species:
Recreational fishing can have negative impacts on fish populations if it occurs at high levels or is not managed properly. Potential impacts from fishing include direct mortality from harvest and catch and release; injury to fish caught and released, changes in age and size class distribution, changes in reproductive capacity and success, loss of genetic diversity, altered behavior, and changes in ecosystems and food webs (Lewin et al. 2006, Cline et al. 2007).

These impacts are often disproportionate among fish species, sizes, ages, sexes, and based on other behavioral traits because anglers selectively catch fish based on these factors (Lewin et al. 2006). In general, anglers tend to target larger and older fish. The selective removal of larger and older fish can have a variety of impacts of fish population dynamics. First, it can decrease the age and size class distribution in fish populations. Second, larger and older fish tend to have greater reproductive capacity because they are better able to compete for spawning areas and generally have higher egg outputs. Because of this, their selective removal may reduce the populations overall reproductive success. Depending upon the species, anglers may also be more likely to catch males (e.g., some male largemouth bass are more aggressive towards lures) or

females (e.g., in some species females grow faster). Also, fish that are more active during the day are often more vulnerable to being caught (Lewin et al. 2006).

Catch-and-release fishing can also have impacts on individual fish, including immediate or delayed mortality. The likelihood of mortality is related to the type of fishing gear used, where the fish is hooked, how the fish is handled, angler experience, and environmental conditions. In general, circle hooks tend to cause less damage than barbed hooks. Also, fish hooked in the lips or jaws tend to have minimal mortality as compared to fish hooked in the gills, esophagus, intestine, or eyes. Fish caught and released with nonlethal injuries may also be exposed to parasites, or bacterial or fungal infections. Individuals that are caught and then handled may also experience stress, which can lead to changes in physiology and behavior which can in turn impact their growth, reproduction, and immune system (Lewin et al. 2006).

Since fishing generally removes individuals from a population, at high levels it can lead to reduced population sizes and loss of genetic diversity. The loss of genetic diversity can ultimately reduce a population's fitness, resilience, and ability to adapt to environmental changes and stressors, such as climate change. The higher the fishing mortality, the greater these types of impacts would be (Lewin et al. 2006).

While fishing does remove individuals from the population, we do not anticipate that current or projected fishing pressure would affect the WPA's fish populations as a whole. The State sets catch limits, designated waters, and fishing seasons to protect the State's fish populations. As a shallow water impoundment, Carlton Pond is dominated by common, warm water species. In addition, there are no known federally listed or State-listed fish species in WPA waters. As stated previously, fish species usually sought are chain pickerel, yellow perch, bullheads, and smallmouth and largemouth bass. While popular with anglers, smallmouth and largemouth bass are not native to Maine (MDIFW 2001). According to Maine Department of Inland Fisheries and Wildlife (MDIFW), there has been an increase of 47 percent in the number of lakes with one or more species of bass between 1980 and 2000 (MDIFW 2001). Chain pickerel are thought to be native only to southern Maine, and are therefore not considered native to Carlton Pond WPA (MDIFW 2008). Based on the MDIFW (2008) assessment, abundance of chain pickerel is increasing; and, despite State efforts to limit the distribution of pickerel, the species distribution is also increasing (MDIFW 2008). Bullhead and yellow perch are also considered to be nonnative to Carlton Pond WPA (MDIFW 2002). Both species are widely distributed throughout the State, and fishery managers have made efforts to reduce their range to reduce competition with native species such as brook trout (MDIFW 2002). We do not have abundance estimates specifically for Carlton Pond WPA waters; however, given the distribution of these species and the State's estimates of abundance, we do not expect fishing pressure at Carlton Pond WPA to have adverse effects on these species.

Illegal take can also impact fish populations. Periodic patrol by our refuge officer in cooperation with Maine State game wardens would help reduce illegal take.

Impacts on Other Wildlife:
Fishing has the greatest potential to impact aquatic and semi-aquatic species in WPA fishing areas. In particular, fishing has the potential to disturb waterfowl and waterbird species. Fishing

seasons in Maine coincide in part with spring-early summer nesting and brood-rearing periods for many species of aquatic-dependent birds. Anglers can also affect the number, behavior, and temporal distribution of some species of birds, including bald eagles, common ravens, and American crows (Knight et al. 1991). Human activity, including both walking and boat use, has the potential to affect the distribution, abundance, and species richness of water birds by disturbing birds that are overwinter, resting, foraging, reproducing, and nesting.

Disturbances from recreational activities vary with the wildlife species involved and the activity's type, level, frequency, duration, and the time of year it occurs. The responses of wildlife to human activities include avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Kahl 1991, Klein 1993, Whittaker and Knight 1998), the use of suboptimal 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, Whittaker and Knight 1998), attraction (Whittaker and Knight1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Anglers may disturb nesting birds by approaching too closely to nests, causing nesting birds to flush. Flushing may expose eggs to predation or cooling, resulting in egg mortality. This is unlikely as birds nesting and rearing areas are difficult to access on land because of marsh conditions. If disturbance from anglers becomes a problem we would close refuge areas seasonally to fishing around sensitive nest sites, in conjunction with the State of Maine, if necessary.

Visitors to the refuge engaged in fishing would generally be walking across refuge lands to reach the pond. Several studies have examined the effects of recreationists on birds using shallow-water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the Eastern United States (Burger 1981, Burger 1986, Klein 1993, Klein et al. 1995, Rodgers and Smith 1995, Rodgers and Smith 1997, Burger and Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbances from recreation activities have at least temporary effects on the behavior and movement of birds within a habitat or localized area.

Lost fishing tackle may harm waterfowl, eagles, and other birds externally by catching and tearing skin. Fishing line may also become wrapped around body parts and hinder movement (legs, wings), impair feeding (bill), or cause constriction with subsequent reduction of blood flow and tissue damage. An object above or below the water surface may snag entangled animals, from which they are unable to escape. Nineteen percent of loon mortalities in Minnesota were attributed to entanglement in fishing line (Ensor et al. 1992). Entanglement in fishing line has also caused mortality in bald eagles. Birds may also ingest sinkers, hooks, floats, lures, and fishing line. Ingested tackle may cause damage or penetration of the mouth or other parts of the digestive tract, resulting in impaired function or death. Lead tackle is particularly toxic to wildlife. An investigation into causes of mortality in loons in New England found 52 percent of loon carcasses submitted to Tufts University Wildlife Clinic had died of lead poisoning from ingestion of lead sinkers (Pokras and Chafel. 1992). Maine law prohibits the sale of lead sinkers that weigh less than 0.5 ounces (Maine Title 12, part 13, subpart 4, chapter 923, subchapter 5, 12663-A). Because of the threat of lead poisoning to waterbirds from ingestion of lead sinkers, we prohibit the use of any lead fishing sinkers or jigs on the WPA. There have not been many cases of wildlife loss due to lost fishing gear on the WPA; however, the refuge and the State

would continue to provide education and outreach on the hazards of lead sinkers and discarded fishing tackle. Our refuge officer would help in that public outreach.

Water Quality Impacts:
Pollutants from human waste and litter have the potential to have negative impacts on water quality. Extensive water quality testing on Carlton Pond and its tributaries has not been carried out. As such, impacts on local aquatic systems are unknown. We would initiate public outreach and education on littering, pollutants, and proper waste disposal if the use increases substantially above current use levels to help mitigate water quality impacts. Water quality testing would be carried out as funding levels permit.

Bank erosion from human activity (foot traffic) may increase aquatic sediment loads of ponds, or alter riparian vegetation in ways harmful to fish or other wildlife. We do not intend to construct any new trails or boardwalks to provide shore-based fishing access. Therefore, there may be minor impacts associated with the transportation of fishing equipment to the shoreline, especially the heavy equipment used for ice fishing. However, we believe effects of this use on soil erosion and vegetation would be minor for the following reasons. First, effects on soil erosion and vegetation trampling associated with current and projected levels of ice fishing are expected to be minimal since this activity occurs in winter months, when the ground is frozen and vegetation is generally dormant. During other times of year, most anglers appear to access the pond using non-motorized boats, which also minimizes potential impacts of soil erosion and vegetation trampling. Lastly, fishing has been an authorized public use at the WPA for many years, and Service staff are unaware of any bank erosion or vegetation trampling issues associated with fishing at Carlton Pond WPA. Therefore, at current and projected levels of use we expect only minor adverse impacts to soil or vegetation from foot traffic related to fishing.

Other Impacts:
Accidental or deliberate introductions of nonnative fish that may negatively impact native fish, wildlife, or vegetation. The refuge would continue to work cooperatively with the State in providing educational outreach and signs on preventing introductions of nonnative fish and try to contain introductions if they occur.

Accidental introduction of invasive plants, pathogens, or exotic invertebrates, attached to fishing boats may also impact native vegetation, wildlife, and habitats. With the exception of a few isolated occurrences of purple loosestrife, WPA waters appear to be relatively free of invasive aquatic plants and mollusks. However, we have not carried out extensive surveys of aquatic invasives. We can mitigate the potential for introductions by having boaters clean their boats before launching and after retrieving. We would also post launch sites with educational materials and have law enforcement officers make spot checks of vessels for compliance and to educate boaters on proper methods for checking for aquatic hitchhikers.

There may be some conflicts between anglers and birders. If other conflicts should arise, the refuge may need to place additional constraints on public uses to minimize conflicts. Management actions may include, but are not limited to: education and outreach, zoning (in space and/or time), and separating user groups.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond WPA, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- We would manage the public fishing program in accordance with Federal and State regulations and review it annually to ensure that wildlife and habitat management goals are achieved and that the program is providing a safe, high-quality outdoor experience for participants. Therefore, adherence to the regulations stated herein would ensure compatibility with the purpose for which the refuge was established.

- All boats, trailers, motors, and fishing gear would be encouraged to be inspected by the owner for plant material and cleaned prior to launching and after retrieval.

- Compliance with regulations would be achieved through education, posted signs, and law enforcement which would result in minimizing negative impacts to refuge habitat and wildlife. Individuals fishing in Carlton Pond WPA are subject to the inspection of licenses, fishing equipment, fish creels and containers, vehicles, and their contents by Federal or State officers.

- No commercial fishing or collecting bait for commercial purposes would be allowed.

- Maine law prohibits the sale of lead sinkers weighing less than 0.5 ounces (Maine Title 12, part 13, subpart 4, chapter 923, subchapter 5, 12663-A). Use of any lead fishing sinkers or jigs is prohibited on the WPA.

- The refuge would be open to fishing during regular refuge hours, sunrise to sunset.

JUSTIFICATION:

Fishing is a priority public use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife resources (The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997). The Service's policy is to provide opportunities for this use when

compatible and consistent with sound fish and wildlife management. Fishing is also a popular, traditional recreation activity in Maine that is strongly supported by the Maine Department of Inland Fisheries and Wildlife.

Allowing fishing on Carlton Pond WPA would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the WPA was established. As listed in the purposes section of this compatibility determination, the refuge was established and subsequently land was acquired for two main purposes centered around migratory birds, with a focus on migratory waterfowl. This use does not adversely impact these purposes because: (1) these uses occur and are expected to remain at relatively low levels, and (2) at current and projected levels of use wildlife and habitats, including migratory birds, do not appear to be appreciably negatively affected by this use. We have made this determination based on lack of observed habitat degradation, because disturbance to wildlife is expected to be short term, and these uses are concentrated in areas away from the sensitive nesting and feeding areas. Therefore, no significant adverse effects from fishing are anticipated. In addition, allowing these uses supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013). These activities would not materially interfere with or detract from the mission of the Service, because providing these wildlife-dependent recreational opportunities is a focus of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature and Date)

CONCURRENCE: Regional Chief: _____
(Signature and Date)

MANDATORY 15-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Bauer, H., H. Stark, and P. Frenzel. 1992. Disturbance factors and their effects on water birds wintering in the western parts of Lake Constance. Der Ornithologische Beobachter 89(2):81-91.

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Bouffard, S.H. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Transactions of North American Wildlife and Natural Resources Conference 47:553-558.

Boyle, S.A., and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: a review. Wildlife Society Bulletin 13:110-116.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

——— 1986. The effect of human activity on shorebirds in two coastal bays in Northeastern United States. Biological Conservation 13:123-130.

Burger, J., and M. Gochfeld. 1998. Effects of eco-tourists on bird behavior at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

Cline, R., N. Sexton, and S.C. Stewart. 2007. A human-dimensions review of human-wildlife disturbance: a literature review of impacts, frameworks, and management solutions. U.S. Geological Survey, Open-File Report 2007-1111, 88 pp.

Ensor, K.L., D.D. Helwig, and L.C. Wemmer. 1992. The common loon in Minnesota: potential contaminant implications. *In:* L. Morse, S. Stockwell and M. Pokras, eds., Proceedings from the 1992 conference on the loon and its ecosystem: status, management, and environmental concerns, Bar Harbor, Maine.

Evenson, D., C. Hopkins, and G. Martz. 1974. Waterfowl and waterfowl hunting at Houghton Lake. Michigan Department of Natural Resources, Wildlife. Division, Infor. Circ. 171, Lansing, Michigan. 7pp.

Hartman, G.W. 1972. The biology of dump nesting in wood ducks. M.S. thesis, University of Missouri-Columbia. 66pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Johnson, R.E. 1964. Fish and fowl. Pages 453-458 *in:* J.P. Linduska, ed.,Waterfowl tomorrow. U.S. Department of the Interior, U.S. Fish and Wildlife Service. U.S. Government Printing Office, Washington, DC.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48: 561-567.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Klein, M.L., S.R. Humphrey, and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. Conservation Biology 9: 1454-1465.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Korschgen, C.E., and R.B. 1992. Dahlgren. Human disturbances of waterfowl: causes, effects, and management. U.S. Fish and Wildlife Service Leaflet. 13.2.15: 8pp.

Lewin, W.C., R. Arlinghaus, and T. Mehner. 2006. Documented and potential biological impacts of recreational fishing: insights for management and conservation. Reviews in Fisheries Science 14:305-367.

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2001. Black Bass Management Plan. Department of Inland Fisheries and Wildlife Division of Fisheries and Hatcheries. 39 pp. Available online at *http://www.maine.gov/ifw/fishing/species/ management_plans/blackbass.pdf.* Accessed January 29, 2013.

——— 2002. Minor Sportfish Management Plan. Department of Inland Fisheries and Wildlife Division of Fisheries and Hatcheries. 31pp. *http://www.maine.gov/ifw/fishing/species/ management_plans/minorsportfish.pdf.* Accessed January 29, 2013.

——— 2008. Chain Pickerel Assessment. Department of Inland Fisheries and Wildlife Division of Fisheries and Hatcheries. 17pp. *http://www.maine.gov/ifw/fishing/species/ management_plans/pickerel.pdf.* Accessed January 29, 2013.

Mathews, G.V.T. 1982. The control of recreational disturbance. Pages 325-330 *in* D.A. Scott, ed., Managing wetlands and their birds, a manual of wetland and waterfowl management. Proceedings 3rd Technical Meeting on Western Palearctic Migratory Bird Management, Biologishche Station Rieselfelder Münster, Federal Republic of Germany, 12-15 October 1982.

Mickelson, P.G. 1975. Breeding biology of cackling geese and associated species on the Yukon-Kuskokwim Delta, Alaska. Wildlife Monograph 45. The Wildlife Society, Washington, DC. 35pp.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410.

Ogilvie, M.A. 1981. The mute swan in Britain, 1978. Bird Study 28:87-106.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Pokras, M.A., and R. Chafel. 1992. Lead toxicosis from ingested fishing sinkers in adult common loons (*Gavia immer*) in New England. Journal of Zoology and Wildlife Medicine 23(1):92-97.

Reichholf, J. 1976. The influence of recreation activities on waterfowl. Pages 364-369 *in* M. Smart, editor. Proceedings of the International Conference on Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December 1974. International Waterfowl Research Bureau, Slimbridge (Glos), England.

Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

——— 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Rupp, R.S. 1955. Studies of the eastern brook trout population and fishery in Sunkhaze Stream, Maine. Journal of Wildlife Management 19(3):336-345.

Smithwood, D.A. ,and J.F. McKeon. 1999. Sunkhaze Meadows National Wildlife Refuge fisheries management plan. U.S. Fish and Wildlife Service, Laconia, New Hampshire.

Speight, M.C.D. 1973. Outdoor recreation and its ecological effects: a bibliography and review. University College, London, England, Discussion Paper Conservation 4. 35pp.

U.S. Fish and Wildlife Service (USFWS). 1988. Final Environmental Assessment, Proposal to Establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge Preliminary Station Management Plan.

——— 1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

——— 2011. 2011 National survey of fishing, hunting, and wildlife-associated recreation: national overview. U.S. Fish and Wildlife Service. Washington, DC.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. April 2013.

Ward, D.H. and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312–317.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

COMPATIBILITY DETERMINATION

USE: Hunting

REFUGE NAME: Carlton Pond Waterfowl Production Area

DATE ESTABLISHED: November 24, 1965

ESTABLISHING AUTHORITIES:
Carlton Pond Waterfowl Production Area (WPA) was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965. It was established under the following legislative authorities:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "…as Waterfowl Production Areas" subject to "…all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" ((16 U.S.C. 718c) (Migratory Bird Hunting and Conservation Stamp Act)).

2. "…for any other management purpose, for migratory birds." ((16 U.S.C. 715d) (Migratory Bird Conservation Act)).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resource and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is hunting by the public. Hunting is a priority public use of the National Wildlife 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 (Refuge Improvement Act; Public Law 105-57). Per 50 CFR 32.1, "Lands acquired as 'waterfowl production areas' shall annually be open to the hunting of migratory game birds, upland game, and big game subject to the provisions of State law and regulations and the pertinent provisions of 50 CFR parts 25 through 31 of this subchapter: *Provided*, That all forms of hunting or entry on all or any part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations."

(b) Where would the use be conducted?
Hunting would be allowed on Carlton Pond Waterfowl Production Area (WPA) which is located in the town of Troy, Waldo County, Maine.

(c) When would the use be conducted?
Hunting would be conducted during State of Maine seasons for big game, upland game, and migratory bird hunting seasons, and would be in accordance with Federal and State regulations. In cooperation with the State, hunt season dates and bag limits may be adjusted in the future as needed to achieve balanced wildlife population levels and to limit conflicts with other user groups.

(d) How would the use be conducted?
The refuge permits hunting in accordance with State and Federal guidelines. Per 50 CFR 32.1, all forms of hunting on all or any part of Carlton Pond WPA may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (i.e., walking).

(e) Why is the 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. According to Federal regulations, waterfowl production areas "shall annually be open to the hunting of migratory game birds, upland game, and big game…" subject to the provisions of State and Federal laws and regulations..." (50 CFR 32.1)

AVAILABILITY OF RESOURCES:

Additional fiscal resources to conduct this activity would be minimal as Carlton Pond WPA has been open to hunting since 1965 and since hunting would continue to occur under State regulations and not as a refuge regulated hunting program. Costs associated with administration of this use include:

Preparation of Annual Hunt Plan:	$500	GS-11 Wildlife Biologist GS-12 Deputy Refuge Manager
Preparation and Updating of Refuge Hunting Brochure:	$300	GS-12 Deputy Refuge Manager GS-9 Refuge Officer
Dispensing Information during year:	$200	GS-6 Administrative Assistant
Law Enforcement/Outreach:	$3,000	GS-9 Refuge Officer
Total:	**$4,000**	

Based on a review of the budget allocated for hunting management, funding is adequate to ensure compatibility, administer, and manage the recreational use listed. Sufficient resources are available to continue the existing hunting program. Our existing staff and budget have provided sufficient resources to continue current management.

ANTICIPATED IMPACTS OF THE USE:

Effects on Wildlife – Migratory Birds

Waterfowl

Adverse effects on waterfowl populations are not expected because of the hunting regulations and bag limits that have been set in place by the Federal and State agencies (USFWS Migratory Bird Office and the Maine Department of Inland Fisheries and Wildlife (MDIFW)) that manage the harvest of waterfowl populations. Significant conservation measures and extensive pre- and post-season population monitoring and the institution of Adaptive Harvest Management are safeguards inherent in waterfowl management. Adverse effects on other game species are not expected, because hunting would occur under state regulations. The MDIFW sets harvest limits that take into account game species population data collected by State biologists and wildlife species assessments.

Woodcock

Restrictive hunting regulations have been in effect for American woodcock since 1985 when surveys indicated a decline in numbers since the 1960's. The Service and State agencies monitor the population closely through a Migratory Bird Harvest Information Program (HIP) and also spring singing male counts (SGS) throughout the birds range.

Based on data from the HIP, 7,100 woodcock hunters harvested 31,700 woodcock in Maine last year. The long-term trend (1968 to 2011) indicates a decline in woodcock numbers across their range; however, 2011 is the 8th year in a row that the population appears stable. In 2011, the number of males heard on SGS routes (3.58) was slightly higher than last year (3.41) and was above the 10-year average of 3.42. (MDIFW 2011a)

Effects on Wildlife - Resident Mammals

The MDIFW is responsible for the management of resident wildlife including game mammal species. They use a variety of methods to assess population levels and develop harvest strategies. While individual mammals are harvested as part of the refuge's hunt program, because of the State's efforts to monitor and regulate harvest of resident mammal species, we do not expect adverse impacts at the population level from harvesting these species. Additional information on harvests and State efforts to manage game species follows.

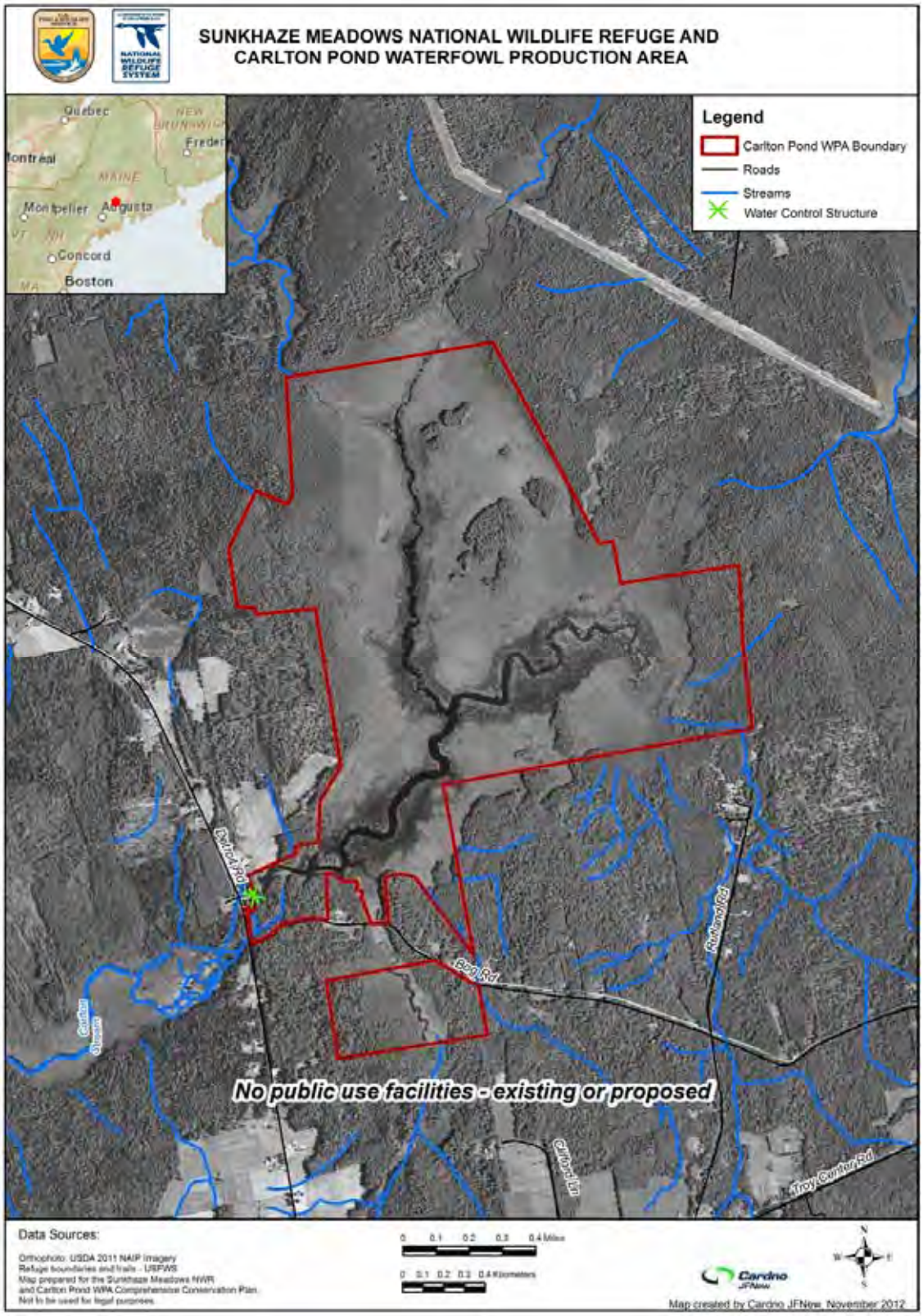
White-tailed Deer

During 2011, 198,107 deer hunting licenses were sold in Maine with hunter densities averaging about seven per square mile. Statewide these hunters spent an estimated 1.08 million hunter days effort pursuing deer during Maine's 79 day deer hunting season. Deer hunting success was estimated at 11 percent in 2011 with 18,784 deer harvested. Wildlife Management District (WMD) 23, which includes Carlton Pond WPA, had 1,657 deer harvested.

Moose

The annual allocation of moose permits is a function of specific management goals for each WMD. Permits were awarded to applicants by a computerized lottery with 49,889 applying for 3,903 permits. In 2011, 2,582 moose were checked into station with 2 moose harvested in the

Map B.27. Service-owned Lands and Waters within Carlton Pond Waterfowl Production Area.



WMD which includes Carlton Pond WPA. Statewide the success rate for last year's hunt was 79 percent which is equal to the average success rate for the last 9 years. Aerial surveys are conducted in nine WMDs to count the number of bulls, cows, and calves. Based on these surveys the state estimates the statewide moose population to be 76,000. These surveys combined with data collected on female moose reproduction, survival rates obtained by aging teeth and hunter sight-rate data, MDIFW ensures harvest is in keeping with a healthy moose population.

Black Bear

The forests of Maine support the largest black bear population in the Eastern United States. For more than 35 years, MDIFW has closely monitored bears to ensure their management decisions are based on current and sound information. Harvest levels are determined based on harvest data and samples of teeth collected which help to show population trends and the number of bears present in the population.

The State regulates harvest by setting season length, bag limit, and legal methods of hunting. Most bears are harvested by hunting over bait (75 percent), 12 percent using dogs, 6 percent by deer hunters, 4 percent by still hunting[2], and 3 percent in traps. The total harvest in 2011 was 2,400 with 8 taken in the WMD that includes Carlton Pond WPA. No baiting is allowed on the WPA which reduces harvest as compared to surrounding areas.

Furbearers and Small Mammals

In Maine many mammals are harvested for their pelt value. Many of the species are harvested by trapping but the following are also hunted: coyote, bobcat, raccoon, skunk, snowshoe hare, gray squirrel, woodchuck, porcupine, and red squirrel.

Currently the State's coyote population is between 10,000 to 12,000 in the winter and increases to 19,000 in spring. This number decreases due to the low number of pups that survive after birth. The coyote population would likely remain relatively constant unless wolves reestablish themselves in the State and then it is believed the coyote population would drastically decline (Jakubas 1999). The coyote population in Maine has been the center of controversy in recent years because of its potential role in affecting deer populations. There is a desire by some public to control or eliminate coyote populations. However, hunting and trapping has been shown to have little effect in determining Statewide population levels. There would need to be mortality rates greater than 70 percent for there to be a reduction in the population (Jakubas 1999). In 2011, 1,623 coyotes were taken in Maine through hunting and trapping.

The red fox population is distributed Statewide (Caron 1986) and is currently considered to be abundant and stable (Jakubas 2004). Red fox are hunted but most of the take for this species is through trapping. Harvests across the State in 2011 through trapping and hunting totaled 922.

The bobcat is a trapped and hunted species that is distributed over most of the State (Morris 1986). The Bobcat Management System is used to manage bobcat populations in the State (McLaughlin 1995). The number of bobcat harvested in 2011 through trapping and hunting was 305.

[2] Rather than being completely 'still,' still hunters move slowly, deliberately, and quietly through the habitat looking for tracks, movement, fur, or other signs of the animal.

Population trends for the stripped skunk, porcupine, and woodchuck are unknown according to the state of Maine since harvests are not recorded. However, these species are commonly seen on the refuge, the WPA, and throughout the State.

Human Disturbance Effects

Hunting can have direct and indirect impacts on both target and non-target species. These impacts include direct mortality of individuals; changes in wildlife behavior; changes in wildlife population structure, dynamics, and distribution patterns; and disturbance from noise and hunters walking on- and off-trail (Cole and Knight 1990, Cole 1995, Bell and Austin 1985). In many cases, hunting removes a portion of the wildlife population that would otherwise naturally succumb to predation, disease, or competition (Bartmann et al. 1992). Typical changes in deer behavior in response to hunting include avoidance of certain areas, becoming more wary, staying closer to cover, and shifting feeding times (e.g., feeding more at night) (King and Workman 1986). For waterfowl species, hunting may also make them more skittish and prone to disturbance, reduce the amount of time they spend foraging and resting, alter their habitat usage patterns, and disrupt their pair and family bonds (Raveling 1979, Owen 1977, White-Robinson 1982, Madsen 1985, Bartelt 1987).

In general, visitors to the WPA engaged in hunting would be walking off-trail in designated areas open to hunting. General disturbances from recreational activities, including hunting, vary with the wildlife species involved and the activity's type, level, frequency, duration, and the time of year it occurs. The responses of wildlife to human activities, such as hunting, include avoidance or departure from the site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschen et al. 1985, Kahl 1991, Klein 1993, Whittaker and Knight 1998), the use of suboptimal 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, Whittaker and Knight 1998), attraction (Whittaker and Knight1998), and an increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). The amount of disturbance tends to increase with decreased distance between visitors and birds (Burger 1986).

Some bird species flee from human disturbance, which can lower their nesting productivity and cause disease and death (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. Bird communities in this study were apparently affected by the presence of recreational trails, where common species (i.e., American robins) were found near trails and more specialized species (i.e., grasshopper sparrows) were found farther from trails. Nest predation also was found to be greater near trails (Miller et al. 1998). 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, makes males rely more heavily on physical deterrents in defending territories, which are time- and energy-consuming (Ewald and Carpenter 1978).

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) note that females with young (such as white-tailed deer) are more likely to flee from a disturbance than those without young.

The hunt at Carlton Pond has been conducted since 1990 with no significant disturbance noted due to this use. This is largely due to the small numbers of hunters participating in the hunt dispersed over a large area. The hunting takes place outside of the migratory bird nesting period further minimizing the potential effects.

Effects on Vegetation

The physical effects on vegetation from hunting various game species on the WPA are expected to be minimal. All-terrain vehicles would not be allowed on the WPA. Other vehicles are restricted to designated roadways. Hunter use is generally dispersed over large areas. Hunters would have little to no impact on the vegetation.

Positive, indirect effects on the vegetation could result from a reduction in the white-tailed deer population. 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). 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 could be positive and result in better regeneration of forest canopy species and an increase in the diversity of the herbaceous understory. In summary, there would be few if any negative impacts from this use on the WPA's vegetation, but there could be beneficial impacts from the decrease of deer browse on the WPA's vegetation due to the decrease in the number of deer on Service lands.

Possible negative cumulative impacts of the proposed activity include temporary trampling of vegetation and light soil erosion. Most hunting occurs during the fall and winter when the ground is either frozen, covered in snow, or when plants are dormant. For these reasons, cumulative impacts to plant communities and soils are not likely to be significant.

Effects on Soils

It is anticipated that minor impacts to soils would occur as a result of allowing hunting access on Carlton Pond. Erosion potential would 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 current and projected levels of use, we expect only minimal impacts to soils (erosion, compaction) because of the time of year, expected low numbers of hunters, and because hunters are spread out around the WPA. This would be an ongoing use of the WPA, and Service staff have observed only minor negative effects, if any, on soils associated with this use to date.

Effects on Air Quality

Air quality and water quality impacts would be minimal and only due to WPA visitors' automobile emissions and run-off on roads and trails. These effects would not only come from hunters but from a majority of users of wildlife-dependent recreation on the WPA. Given the traditional low number of hunters the effects on overall air and water quality in the region would be negligible, compared to the effects from non-WPA sources.

Economic Effects

The 2011 national survey of fishing, hunting, and wildlife-associated recreation reveals that 1,117,000 Maine residents and nonresidents 16 years old and older fished, hunted, or watched

wildlife in Maine. Of that total, 341,000 fished, 181,000 hunted, and 838,000 participated in wildlife watching activities, including observing, feeding, and photographing wildlife (USFWS 2011). While we do not have exact numbers of hunters on the WPA, visitors participating in this use provided some economic benefit to the local economy by purchasing goods and services (e.g., food, lodging, gas) in and around the area.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond WPA, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:
The hunt program would continue to be managed in accordance with Federal and State regulations. The program would be reviewed annually to ensure that wildlife and habitat management goals are achieved and that the program is providing a safe, high quality hunting experience for participants.

- Shotgun hunters may possess only approved nontoxic shot while in the field (see 50 CFR 32.2(k)).
- All forms of hunting on all or any part of Carlton Pond WPA may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations (50 CFR 32.1).
- We allow eastern coyote hunting from October 1 to March 31.
- We allow bear hunting from October 1 to the end of the State-prescribed season. Per 50 CFR 32.2(h), the use of bait is prohibited during the hunting of bears or other wildlife.
- All applicable State and Federal regulations would apply.

JUSTIFICATION:

Per Federal regulations, waterfowl production areas are to be open to hunting unless temporarily closed because of “unusual or critical conditions…affecting land, water, vegetation, or wildlife populations” (50 CFR 32.1). Public hunting is also a priority public use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife resources (The National Wildlife Refuge System Administration Act of 1966, as amended by the

National Wildlife Refuge System Improvement Act of 1997). The Service's policy is to provide enhanced opportunities for this use when compatible and consistent with sound fish and wildlife management. In addition, hunting is an historic use of the WPA. It is a popular, traditional recreation activity on public lands in Maine that is strongly supported by the Maine Department of Inland Fisheries and Wildlife.

Allowing hunting the WPA will not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the WPA was established. As listed in the purposes section of this compatibility determination, the WPA was established and subsequently land was acquired for two main purposes related to migratory birds. As discussed under the section on anticipated impacts above, hunting is a wildlife-dependent priority public use with minimal adverse impacts on WPA resources; therefore, no significant adverse effects from public hunting are anticipated. Because of this, it is consistent with the WPA's migratory bird purposes. In fact in contrast to refuges, WPAs are open to hunting unless closed, so continuing to allow hunting supports Service regulations, the Service policy on hunting, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Allowing this use supports CCP goals and objectives as described in the WPA's draft CCP and EA (USFWS 2013). This activity will not materially interfere with or detract from the mission of the Service, because providing this wildlife-dependent recreational opportunity is a focus of the National Wildlife Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 15-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Arcese, P. 1987. Age, intrusion pressure and defense against floaters by territorial male song sparrows. Animal Behavior 35:773-784.

Bartelt, G.A. 1987. Effects of disturbance and hunting on the behavior of Canada geese family groups in East Central Wisconsin. Journal of Wildlife Management 51:517-522.

Bartmann, R.M., G.C. White, and L.H. Carpenter. 1992. Compensatory mortality in a Colorado mule deer population. Wildlife Monographs 121.

Behrend, D.F., G.F. Mattfield, W.C. Tierson and J.E. Wiley. 1970. Deer density control for comprehensive forest management. Journal of Forestry 68:695-700.

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Bell, D.V., and L.W. Austin. 1985. The game-fishing season and its effects on overwintering wildfowl. Biological Conservation 33:65-80.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

Caron, M. 1986. Red fox assessment – 1985. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 34 pp.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. Pages 425-466, *in:* Hendee, J.C., G.H. Stankey, R.C. Lucas, eds., Wilderness Management. North American Press, Golden, Colorado.

Cole, D.N., and R.L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. Natural Resources and Environmental Issues 0:33-40.

Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in two Mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation. 18:39-51.

Ewald P.W., and F.L. Carpenter. 1978. Territorial responses to energy manipulations in the Anna hummingbird. Oecologia 31:277-292.

Hammitt, W.E., and D.N. Cole. 1998. Wildlife Recreation: Ecology and Management (2nd edition). New York: John Wiley & Sons. 361pp.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.

Jakubas, W.J. 1999. Coyote assessment – 1999. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 67 pp.

——— 2004. Furbearers and small game mammals. Pages 20-22 *in:* Wildlife Division Research and Management Report 2004. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 78 pp.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. Wildlife Society Bulletin 19:242-248.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

King, M.M., and G.W. Workman. 1986. Response of desert bighorn sheep to human harassment: management implications. Transactions 51st North American Wildlife and Natural Resource Conference.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbance. Wildlife Society Bulletin 21:31-39.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Korschen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pages 249-297, *in:* A. Sprunt IV, J.C. Ogden, and S. Winckler, eds., Wading Birds, Res. Rep. 7. National Audubon Society, New York.

Madsen, J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. Biological Conservation 33:53-63.

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2011a. Research and Management Report. State of Maine.

——— 2011b. Migratory Game Bird Hunting Schedule. State of Maine.

——— 2011c. Hunting and Trapping Laws and Rules. State of Maine.

McLaughlin, C.R. 1995. Bobcat management system. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 21 pp. plus appendixes.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of Recreational Trails on Breeding Bird Communities. Ecological Applications 8:162-169.

Morris, K.I. 1986. Bobcat Assessment 1986. Maine Department of Inland Fisheries and Wildlife, 284 State Street, State House Station 41, Augusta, Maine, 04333-0041. 43 pp.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management 53:401-410.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Raveling, D.G. 1979. Traditional use of migration and winter roost sites by Canada geese. Journal of Wildlife Management. 43:229-235.

Tierson, W.C., E.F. Patric, and D.F. Behrend. 1966. Influence of white-tailed deer on the logged northern hardwood forest. J. Forestry. 64:804-805.

Tilghman, N.G. 1989. Impacts of white-tailed deer on forest regeneration in northwestern Pennsylvania. Journal of Wildlife Management 53:524-532.

U.S. Fish and Wildlife Service (USFWS). 1990a. Final environmental assessment: Public hunting at Sunkhaze Meadows National Wildlife Refuge, Maine.

——— 1990b. Hunting management plan for Sunkhaze National Wildlife Refuge.

——— 1997. National Wildlife Refuge Improvement Act 1997. Public Law 105-57-Oct. 9, 1997.

——— 2011. 2011 National survey of fishing, hunting, and wildlife-associated recreation: national overview.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. Spring 2013.

Ward, D.H., and R.A. Stehn. 1989. Response of brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

White-Robinson, R. 1982. Inland and saltmarsh feeding of wintering brent geese in Essex. Wildfowl 33:113-118.

Whittaker, D., and R.L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312-317.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied brant geese and widgeon in relation to agricultural management. Wildfowl 31:151-157.

COMPATIBILITY DETERMINATION

USE: Furbearer Management (trapping)

REFUGE NAME: Carlton Pond Waterfowl Production Area

DATE ESTABLISHED: November 24, 1965

ESTABLISHING AUTHORITIES:
Carlton Pond Waterfowl Production Area (WPA) was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965. It was established under the following legislative authorities:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "…as Waterfowl Production Areas" subject to "…all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" ((16 U.S.C. 718c) (Migratory Bird Hunting and Conservation Stamp Act)).

2. "…for any other management purpose, for migratory birds." ((16 U.S.C. 715d) (Migratory Bird Conservation Act)).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

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 Service management economic activity. It is not a priority public use of the National Wildlife 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 an allowable practice in Maine. Currently, there are no restricted locations within the Carlton Pond WPA. Zones have not been established nor limits set. However, if necessary, such controls could be implemented to meet our goals for protecting WPA resources.

Service law enforcement would ensure that trappers on the WPA comply with State regulations.

(c) When would the use be conducted?
Furbearer management would be conducted in accordance with the State of Maine seasons. Maine furbearer management seasons usually run from mid-October to the end of December, with beaver trapping in Wildlife Management District 23, where the Carlton Pond WPA is located, allowed until the end of March.

(d) How would the use be conducted?
The WPA would be open to furbearer management for the following species: beaver, bobcat, mink, fisher, marten, coyote, fox, muskrat, opossum, otter, raccoon, red squirrel, skunk, and weasel. Although bear trapping is allowed in Maine, bears are not considered a furbearer. Bear trapping is not allowed.

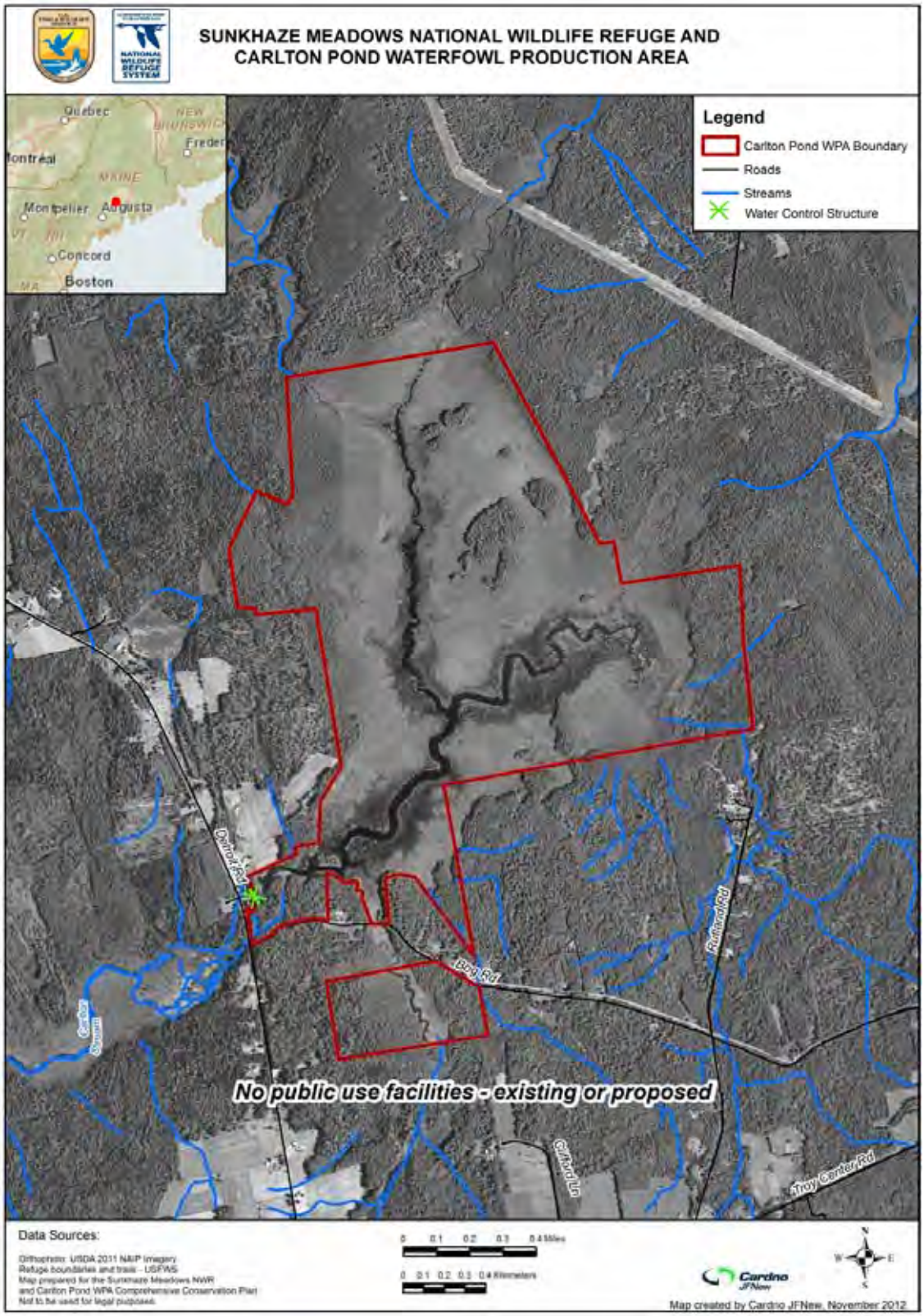
We would continue to allow furbearer management following Maine State regulations during State seasons and under State limits for the targeted species. Visitors participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (i.e., walking and snowshoeing). To facilitate checking traps and retrieval of game, trappers would be allowed to use snowshoes.

Special use permits would not be required per 50 CFR 31.16, "Land acquired as 'waterfowl production areas' shall be open to public trapping without a Federal permit provided that…all or part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions affecting land, water, vegetation, or wildlife populations."

To gather information about trapping effort and furbearer populations, we would encourage persons who inquire about trapping at Carlton Pond WPA to communicate with us at the end of the season to let us know how much time they spent and what they caught.

(e) Why is this use being proposed?
As discussed above, per 50 CFR 31.16, "Land acquired as 'waterfowl production areas' shall be open to public trapping…." Because trapping is considered an economic use, per Federal law (see 16 U.S.C. 715s) and Service regulations (50 CFR 29.1), we may only allow economic uses of a refuge or WPA natural resource where the use contributes to achieving refuge or WPA purposes or the Refuge System mission. We would conduct furbearer management: (1) as a tool to manage habitat and maintain the predator-to-prey balance, (2) as a mechanism to collect survey and monitoring information that otherwise would be expensive and difficult to obtain using Service resources, and (3) as a way to collect initial data 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. Trappers on the WPA 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 onsite reports concerning the fundamental status of habitat, wildlife, and WPA conditions.

Map B.28. Service-owned Lands and Waters within Carlton Pond Waterfowl Production Area.



AVAILABILITY 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. A Service law enforcement officer, in coordination with other law enforcement agencies, will check trappers and ensure compliance with State regulations.

A breakdown of the projected annual cost of the trapping programs is shown below:

Law Enforcement:	$800

ANTICIPATED IMPACTS OF THE USE:

The impacts of furbearer management on the purposes of the WPA and mission of the Refuge System can be either direct or indirect, and may have negative, neutral, or positive impacts on WPA resources.

Direct effects include the removal of individuals of both target (i.e. furbearer) and 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 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, yet State natural resources agencies indicate that, with exceptions, furbearer populations are stable or increasing. The anticipated direct impacts of trapping on wildife 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 WPA objectives, minimize furbearer damage to facilities and wildlife habitat, minimize competition with or interaction among wildlife populations and species that conflict with WPA objectives, and minimize threats of disease to wildlife and humans.

Furbearer species have the potential to significantly alter WPA habitats without regulated trapping. Furbearing species must be managed at levels consistent with WPA habitat, wildlife, and public use objectives. Regulated trapping is the most desirable and effective method to accomplish an acceptable balance (Payne 1980, Jensen et al. 1999). Hunting alone is relatively ineffective in managing aquatic and many terrestrial furbearer species due to their secretive habits; trapping is the single-most viable management alternative (Payne 1980). Unchecked furbearer populations can exhibit marked fluctuations in numbers often with severe consequences for habitat, wildlife, and humans. By way of illustration, in the absence of regulated trapping, the beaver population in Massachusetts increased from 24,000 in 1996 to more than 52,000 in 1999 (S. Langlois, Furbearer Project Leader, Massachusetts Division of Fisheries and Wildlife, personal communication).

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 the welfare of animals in trapping through trap testing and the development of "Best Management Practices (BMPs) for Trapping Furbearers in the United States." The WPA 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 Other Wildlife:
Non-target species could be taken incidentally through this trapping program. Traps will be set specifically around areas of targeted species activity to reduce the risk of taking species other than targeted species. The experience of the trappers and the selection of the appropriate trap size will reduce non-target captures (Northeast Furbearer Resources Technical Committee 1996, Boggess et al. 1990). State regulations require that bait be covered, so birds of prey are not able to see the bait from above. Lynx (federally listed as endangered) have not been documented on the WPA. Therefore, potential impacts to lynx are negligible or nonexistent. If lynx are someday identified on the WPA, the refuge manager will work with the State of Maine to implement measures to prevent accidental take of lynx. The refuge manager will ensure that measures are utilized to avoid take of waterfowl and endangered species.

Trappers may temporarily disturb wildlife while walking or snowshoeing around the WPA. Disturbances 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 and breeding wildlife using the WPA, disturbance of migratory birds by trappers would be negligible, and can be further reduced by regulating trapping activity in certain areas at times when such birds are likely to be present.

Conflicts with Other Public Uses:
A program of regulated furbearer management on the WPA as described under this compatibility determination is not expected to conflict with other public uses. With respect to possible negative reaction to trapping on the WPA by some members of the visiting public, conflicts are not expected because trapping is generally an inconspicuous activity, traps are usually hidden from view, typically are not set near roads, and are checked in the early morning. These characteristics serve to limit the potential for encounters between traps or captured animals and those engaged in other public use activities.

Other Beneficial Impacts:
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, and the conservation and enhancement of biological and genetic diversity (Boggess et al. 1990, Organ et al. 1996).

Implementation of a regulated trapping program on the WPA provides a potential mechanism to collect survey and monitoring information, or 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 even 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 WPA 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. Trappers typically have a stake in proper habitat and wildlife conservation and protection of the ecological integrity of the WPA 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 WPA conditions.

Furbearers are considered a renewable natural resource with cultural and economic values (Andelt et al. 1999, Boggess et al. 1990, Northeast Furbearer Resources Technical Committee 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 WPA also fosters the appreciation of wildlife and nature, wildlife observation, environmental education, a greater understanding of ecological relationships, stewardship of natural resources, and inter-generational passage of the methodologies of renewable resource use. Trapping is an activity in which family members and friends often participate together and share joint 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 comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond WPA, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Trappers must have a State license and comply with all State regulations relating to trapping.
- Trappers, when requested by refuge staff or Federal or State enforcement officers, must display for inspection their State trapping license, trapping equipment, and all animals in their possession.
- Traps shall be set only where traps or trapped furbearers are not readily visible from public highways, overlooks, or other visitor facilities (if established). No land sets may be set within 100 feet of any road or trail (if established) open to the public.
- Use of all-terrain vehicles is prohibited anywhere on the WPA. Trappers must not interfere with or cause hazards to vehicular travel, or the activities of other WPAvisitors.
- The use of exposed bait and setting traps adjacent to naturally occuring carcasses are prohibited.
- Non-target animals that are uninjured should be released immediately. Injured or killed animals must be reported as specified by the Maine Department of Inland Fisheries and Wildlife trapping regulations.
- Trappers are encouraged to communicate with us at the end of the season to let us know how much time they spent and what they caught

JUSTIFICATION:

We have determined that allowing trapping on the WPA would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System or the purposes for which the WPA was established for the following reasons. First, furbearer populations, with local exceptions, are stable or increasing in Maine and the furbearer management program on the WPA does not have any known negative impacts on furbearer populations. Second, at current and projected levels of 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) using the WPA.

In fact, based on the analysis presented above, we have determined that it would contribute to the mission of the National Wildlife Refuge System and the purposes for which the WPA was established. Furbearer management through trapping on the WPA is a useful tool in maintaining

balance between furbearers and habitat. High populations of predators can decrease the survival and nesting success of migratory birds, thus compromising the central purpose of the WPA. Trapping may provide survey and monitoring information that otherwise would be expensive and difficult to obtain using Service 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. Trappers who participate could 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; maintenance of the vigor and health of furbearer populations; and safeguarding the WPA infrastructure critical to habitat management for focal fish and wildlife species. Trapping also helps build appreciation for natural resources, ecological awareness, and support for the Refuge System.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

MANDATORY 10-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY

Andelt, W.F., R.L. Phillips, R.H. Schmidt, and R.B. Gill. 1999. Trapping furbearers: an overview of the biological and social issues surrounding a public controversy. Wildlife Society Bulletin 27(1):53-64.

Boggess, E.K., G.R. Batcheller, R.G. Linscombe, J.W. Greer, M. Novak, S.B. Linhart, D.W. Erickson, A.W. Todd, D.C. Juve, and D.A. Wade. 1990. Traps, trapping, and furbearer management. Wildlife Society Technical Review 90-1, The Wildlife Society, Bethesda, Maryland.

Daigle, J.J., R.M. Muth, R.R. Zwick, and R.J. Glass. 1998. Sociocultural dimensions of trapping: a factor analytical study of trappers in six northeastern states. Wildlife Society Bulletin 26:614-625.

Gentile, J.R. 1987. The evolution of anti-trapping sentiment in the United States: A review and commentary. Wildlife Society Bulletin 15:490-503.

Gill, J.A., W.J. Sutherland, and A.R. Watkinson. 1996. A method to quantify the effects of human disturbance on animal populations. Journal of Applied Ecology 33:786-792.

Glass, R.J., T.A. More, and J.J. DiStefano. 1991. Vermont trappers: characteristics, motivations, and attitudes. Transactions of the Northeast Section of The Wildlife Society 48:134-143.

International Association of Fish and Wildlife Agencies (IAFWA). 1998. Best Management Practices for trapping furbearers in the United States. International Association of Fish and Wildlife Agencies, Washington, DC.

Jensen, P.G., P.D. Curtis, and D.L. Hamelin. 1999. Managing nuisance beavers along roadsides, a guide for highway departments. Federal Aid in Wildlife Restoration Program Number WE-173-G, New York State Department of Environmental Conservation and Cornell Cooperative Extension Service, Cornell University, Ithaca, New York.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the 56th North American Wildlife and Natural Resources Conference pp. 238-247.

Kuss, F.R., and C.N. Hall. 1991. Ground flora trampling studies: Five years after closure. Environmental Management 15(5):715-727.

Maryland Department of Natural Resources. 2000. Furbearer management in Maryland, management tools and their application. 2000. Special Report, Maryland Department of Natural Resources. Annapolis, Maryland.

Mason, D.A. 1990. Vermonts other economy: the economic and socio-cultural values of hunting, fishing, and trapping for rural households. Thesis, University of Vermont, Burlington.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

National Wildlife Federation. 1979. Trapping and conservation. National Wildlife Federation. Washington, DC.

Northeast Furbearer Resources Technical Committee. 1996. Trapping and furbearer management: perspectives from the Northeast. 33pp.

Payne, N.F. 1980. Furbearer management and trapping. Wildlife Society Bulletin 8:345-348.

Schultz, R.D., and M. Stock. 1993. Kentish plovers and tourist-competitors on sandy coasts? Wader Study Group Bulletin 68 (special issue):83-92.

Southwick Associates. 1999. Bears in the backyard, deer in the driveway: The importance of hunting and trapping in helping wildlife professional manage our treasured wildlife resources. International Association of Fish and Wildlife Agencies, Washington, DC.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Sunkhaze Meadows National Wildlife Refuge

Use: Retriever Hunt Test and Field Trial

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(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?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

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_X_ 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**_X_

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: Carlton Pond Waterfowl Production Area

Use: Retriever Hunt Test and Field Trial

Narrative

Members of the Maine Retriever Club occasionally request to use Carlton Pond Waterfowl Production Area (WPA) briefly as one of the water trial sites in their annual retriever hunt test and an annual field trial. The events consist of dogs competing in a series of tests to assess their ability to retrieve downed game. The events adhere to standards as set by the American Kennel Club. This is not a priority public use; however, the use of dogs to retrieve downed game is related to the priority public use of hunting. The objective of permitting these hunt tests and field trials on Service lands is to encourage practices and techniques that enhance the tradition and quality of the hunting experience and reduce the incidence of downed but unretrieved game. We also believe allowing this use would facilitate observation, and appreciation by participants and observers of the event, of the WPA's wildlife, habitats, and conservation programs.

This use is conducted where a finger of Carlton Pond crosses Bog Road; it is estimated that activities would involve less than 10 percent of the water area and less than 7 acres of WPA lands. Previous requests for the retriever hunt test have been for late August, not before August 14 and not after August 31; the field trial has been scheduled during the third weekend in September, so waterfowl breeding is over and the hunting season has generally not begun. A special use permit (SUP) is issued annually, requiring compliance with the specific requirements outlined in Service Manual Chapter 631 FW 5, Field Trials. Because we require organizers of these events to obtain a SUP prior to holding the events, this use is also consistent with 50 CFR 27.91 which prohibits field trials for dogs on national wildlife refuge except where authorized by a SUP.

COMPATIBILITY DETERMINATION

USE: Retriever Hunt Test and Field Trial

REFUGE NAME: Carlton Pond Waterfowl Production Area

DATE ESTABLISHED: November 24, 1965

ESTABLISHING AUTHORITIES:
Carlton Pond Waterfowl Production Area (WPA) was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965. It was established under the following legislative authorities:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "…as Waterfowl Production Areas" subject to "…all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" ((16 U.S.C. 718c) (Migratory Bird Hunting and Conservation Stamp Act)).

2. "…for any other management purpose, for migratory birds." ((16 U.S.C. 715d) (Migratory Bird Conservation Act)).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resource and their habitats within the United States for the benefit of present and future generations of Americans." (16 U.S.C. 668dd-668ee) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority use?
The use is an annual retriever hunt test and an annual field trial. The events consist of dogs competing in a series of tests against other dogs to test their ability to retrieve downed game. The events adhere to standards as set by the American Kennel Club and are coordinated by a local group, the Maine Retriever Trial Club, Inc. This is not a priority public use, however, the use of dogs to retrieve downed game is related to the priority public use of hunting.

(b) Where would the use be conducted?
During the hunt test and the field trial, many sites in the area are used to accommodate all the different tests or age classes of dogs. The use of Carleton Pond has been requested because several water bodies in the area are required, and the availability of Carlton Pond is very helpful in making these events logistically possible. When the club uses Carlton Pond, they

will access the pond where a finger of it crosses Bog Road (see map); it is estimated that activities would involve less than 10 percent of the water area.

Parking and placement of the portable toilet is in a lot on private land nearby and additional parking is available off WPA lands, along Bog Road.

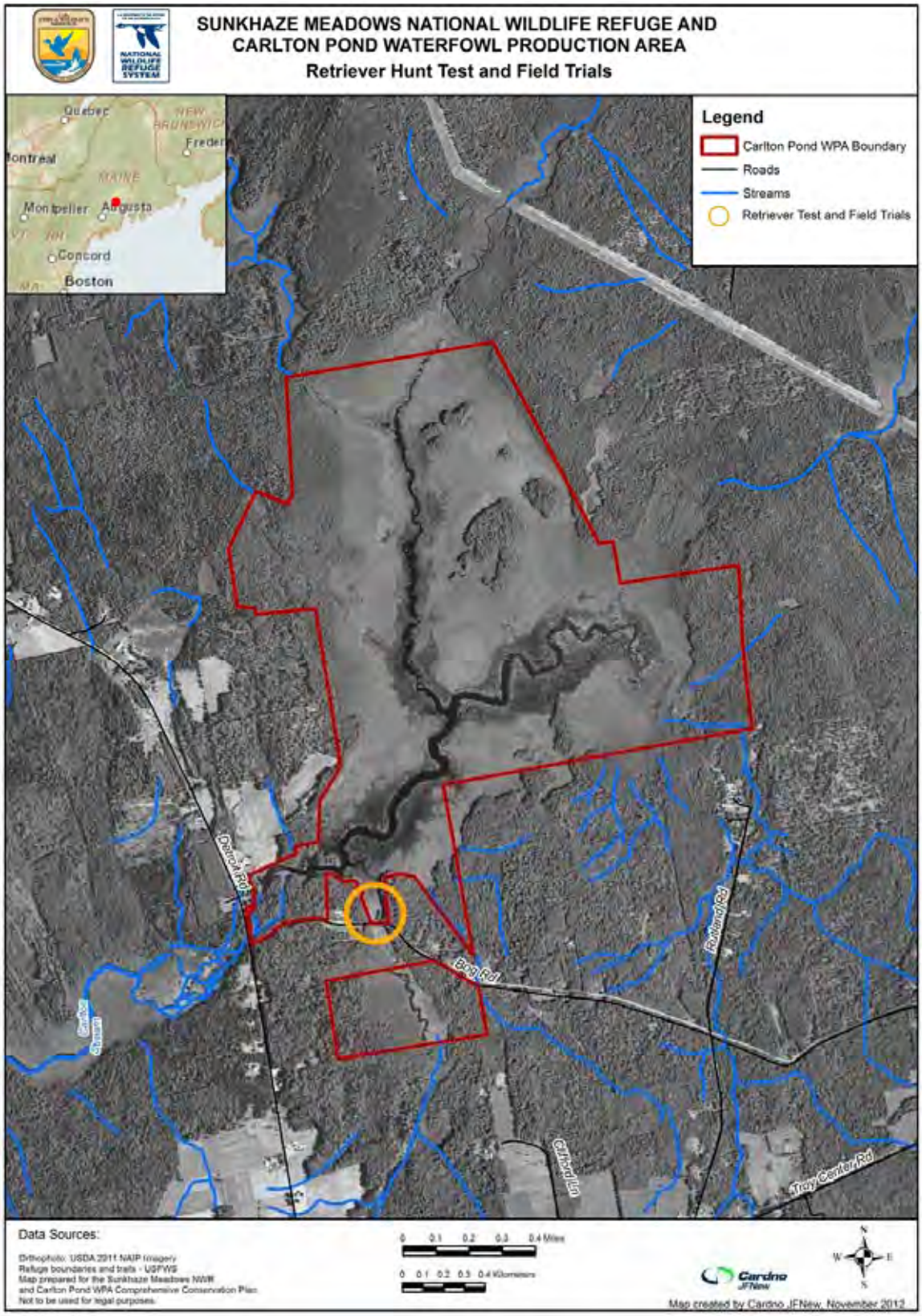
(c) When would the use be conducted?
The hunt test is scheduled in late August, not before August 14 and not after August 31, and the field trial is held the third weekend in September each year. Hunt tests and field trials held by the club earlier in the season will not be allowed to use Carlton Pond due to the conflict with the waterfowl breeding season. Dog training is not allowed at Carlton Pond at any time.

(d) How would the use be conducted?
Typically, field trials have four levels in which dogs can compete, with between 10 to 60 dogs in a given level. Each level requires that dogs are tested in both land and water.

The trials are set up to progressively eliminate dogs that fail to meet the standards of each series of the tests. Land tests are almost always run first, which usually eliminates over half of the dogs running in a given level. The water series usually starts the second day of the competition and begins with what are called blind retrieves. The blind retrieves require a handler to get the dog to a point between 100 and 400 yards away using whistles and hand signals, simulating picking up a downed bird that the dog did not see shot or fall. The final series of the competition at each level tests the ability of the dogs to retrieve ducks that are simulated to have been shot and fallen in or around the water. The simulation usually involves a series of two to four fired shots with a duck thrown to a specific location for each shot. Sometimes, one of those shots within the series includes shooting a live farm-raised duck. Except for the live duck being shot, each of the other retrieves are required to occur in the same location, making it more fair to judge the quality of the retrieve. The water series usually occurs on the last day of the competition and tests only the dogs which have not been eliminated in the first three series.

In their entirety, tests and field trial to be held in this area will serve an estimated 150 to 225 dogs and 20 to 60 handlers per event. The land tests will be run on Saturday at other locations and the any water tests using Carlton Pond will begin either very late Saturday afternoon, or more likely on Sunday. There will be an estimated 70 dogs involved in the water trials at Carlton Pond and an estimated 210 to 280 shotgun rounds fired. Non-toxic shot will be used. Birds must be certified disease free. Like other visitors, dog handlers participating in approved public uses are allowed off-trail; however, off-trail use is limited to pedestrian access only (e.g., walking, snowshoeing, skiing).

Map B.29. Location Where Dog Field Trials are Held at Carlton Pond Waterfowl Production Area.



(e) Why is the use being proposed?
This is an historic use of the refuge and the Maine Retriever Trial Club was not aware of the need to apply for a special use permit (SUP). Refuge staff were not aware that this activity was ongoing until the fall of 2008; no complaints have ever been received. Upon finding out about the requirement to obtain a permit, the club officers promptly applied for one. An interim compatibility determination was issued, with the intent of re-examining the use during the Sunkhaze Meadows National Wildlife Refuge Comprehensive Conservation Plan.

The activity is wildlife oriented, facilitates a priority public use (hunting) by improving the retrieval of downed waterfowl through the use of well trained dogs, minimizing crippling losses and facilitates observation, and appreciation by participants and observers of the event of the WPA's wildlife, habitats, and conservation programs.

AVAILABILITY OF RESOURCES:

This event does not require any special permanent facilities. The retriever club arranges for the delivery and removal of temporary portable toilets on adjacent private land, and directs and controls parking along one side of Bog Road. The refuge staff issues the SUP and monitors the activity to insure compliance with the requirements of the SUP. This activity is within the budget and staffing capabilities of the refuge to manage.

The following is the list of the approximate costs to the refuge required to administer and monitor the SUP including coordinating with the permittee:

Administrative time:	$ 30
Monitoring: (12 hours of Law Enforcement Officer and/or biologist)	$ 504
Total Cost:	**$ 534**

ANTICIPATED IMPACTS OF THE USE:

Direct Impacts
Field trials have the potential to adversely impact wildlife resources through direct disturbance. The presence of dogs may displace foraging birds (Lafferty 2001), disrupt their nesting behavior (Langston et al. 2007, Lord et al. 2001, Taylor et al. 2007), or destroy nests (Nol and Brooks 1982). These effects appear to be most pronounced for species that nest or feed on the ground. The presence of dogs may also reduce both bird diversity and abundance (Banks and Bryant 2007). The visual presence of dogs may alter the physiology and behavior of mammals (Miller et al. 2001) and their persistent scent may displace mammalian predators (George and Crooks 2006, Lenth et al. 2008, Reed and Merenlender 2008).

Miller et al. (2001) showed that the presence of a pedestrian is the additive factor in disturbing wildlife when comparing wildlife response to dog-alone, pedestrian-alone, and dog-on-leash treatments. Flush distance and distance moved were almost always greater when activities occurred off-trail versus when the same activities occurred on-trail,

suggesting that where recreational activities occurring on-trail are frequent and spatially predictable, animals will likely habituate to activity in these locations.

The role of dogs in wildlife diseases is poorly understood. However, dogs host endo- and ecto-parasites, and can contract diseases from or transmit diseases to wild animals. In addition, dog waste is known to transmit diseases that may threaten the health of some wildlife and other domesticated animals. Domestic dogs potentially can introduce various diseases and transport parasites into wildlife habitats (Sime 1999). To minimize this risk, it will be required that handlers collect and properly dispose of any dog feces deposited during the events.

To minimize disturbance to wildlife, the trials will not be held during the waterfowl breeding season. The period of time during which these events are allowed to use Carlton Pond are after the waterfowl breeding season and before the regular waterfowl hunting season begins. Since only a small portion of the water area is being used, any waterfowl that may be using the pond can move to other areas for the small number of days involved. No wild animals will be killed as part of this event, and only non-toxic shot will be allowed to be used on the captive-bred ducks. Captive-reared ducks must be of indigenous species or established exotic species only and must be certified disease-free.

Direct impacts associated with this use also include vegetation disturbance. The access area has a large stand of wild rice. Although the intent is to use the open water areas, at times dogs will be running through emergent vegetation to get to the water or swimming through vegetation to reach a dummy or duck.

Because the activity takes place in August and September, the wild rice growing in the area is already mature. If plants are bent over or broken off at this point, rice kernels will be dislodged, but the plant itself will not be killed. Rice kernels knocked into the water will either be eaten by waterfowl or sink to the bottom to overwinter in the mud and serve as a seed source for spring germination. No long-term impacts to vegetation are anticipated.

The activity may create a conflict with other potential visitors to the WPA. The September weekend date occasionally overlaps with the state's Youth Waterfowl Hunt day on Saturday of that weekend. The club cannot reschedule the event, as dates are assigned by the American Kennel Club to be part of a traveling circuit, so the change to another date would conflict with another event elsewhere. Since the water trials, the only portion that may occur at the pond, begin late on Saturday and more likely only on Sunday, few youth hunters should be inconvenienced. Even if they plan to hunt late on Saturday and arrive to find the field trial ongoing, they could still access the other parts of the pond or hunt in other nearby wetlands. In the 4 years that the use has been allowed by SUP, it only occurred on the same weekend as the Youth Waterfowl Hunt once.

We currently have no data on the number of youth hunters that may use Carlton Pond. In the 4 years of interim compatibility, refuge staff have never actually observed the event. This will be corrected during the coming 5 year compatibility period, as mandatory prior notification and staff attendance will be required. The refuge personnel who will monitor the

event will count the number of youth hunters they finds using the pond on this day as well as the number of dogs and handlers, and will document any user conflicts or other impacts observed.

Indirect Impacts
Indirect impacts would include effects from pollution, litter, introduction of lead shot or non-indigenous birds, or diseased birds, or erosion caused by the activity. The stipulations of the SUP make these impacts unlikely to occur.

Cumulative Impacts
Since this activity occurs but twice a year, in a relatively small area and the direct impacts to vegetation and wildlife are not large, we do not anticipate any significant cumulative impacts.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible __x__

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- The group sponsoring a field trial is required to obtain a SUP from the refuge (per 50 CFR 27.91) which must be re-issued annually. There would be a nominal fee to cover the cost of processing the SUP, currently around $50.00

- Notification of the date and time Carlton Pond will be used as part of a test or trial is required to be given to the refuge staff one week prior to the use and a staff member of the refuge is required to be present to enforce the stipulations of the permit and evaluate the impacts of the activity each time Carlton Pond WPA is used.

- All birds utilized in the trial must be pen-reared game farm stock.

- Only indigenous species or established exotic species of birds may be used as target animals for the field trials.

- Target animals used must have a health certificate, issued by a veterinarian, that provides reasonable assurance of the absence of Type C botulism, avian cholera, duck plague (duck viral enteritis), and aspergillosis.

- A written certification from the game farm operator that he has not had any disease diagnosed or any undiagnosed die-off occurring on his premises within the previous 6-month period must be provided to the refuge manager prior to the trial.

- Target animals should be brought to the site in disposable crates (e.g. cardboard boxes) that have not been used before. Such crates must be properly disposed of after use.

- Only federally approved non-toxic shot may be used in taking the birds.

- Dog feces deposited during the event must be immediately picked up and properly disposed of.

- The trial must be conducted in an orderly manner.

- No alcoholic beverages are allowed at the event.

- The permittee is responsible for collecting and clearing debris and litter during and following the trial.

- Necessary State permits must be obtained prior to the start of the trial.

- An adequate number of portable toilets must be placed nearby and promptly removed after the event.

- Parking must be managed so as not to impede access by emergency vehicles and normal traffic on the road, and so as not to annoy neighbors or impede access to their driveways.

- The number of dogs involved in activities at Carlton Pond WPA must not exceed 70 and the number of handlers must not exceed 50.

- There is no room for concessions at this site; therefore, no concessions would be allowed.

At the refuge manager's discretion, applicants that receive a SUP for this use that fail to comply with one or more of these stipulations may not receive a permit in future years.

JUSTIFICATION:

The objective of permitting these hunt tests and field trials on Service lands is to encourage practices and techniques that enhance the tradition and quality of the hunting experience and reduce the incidence of downed but unretrieved game. These particular retriever tests and field trials, due to their seasonal timing and limited duration, can be managed within existing refuge resources. The refuge SUP conditions limit the scope of the field trial activities to

specific dates and areas and assure that the activity is carried out in a manner that minimizes impacts on wildlife and habitat.

At this time, we believe that the retriever hunt tests and retriever trials as proposed do not materially interfere with or detract from purposes for which the WPA was established or the mission of the National Wildlife Refuge System. We will carefully monitor potential impacts to refuge resources and potential conflicts with other visitors over the next 5 years. We will reevaluate this activity in 5 years, or sooner if deemed necessary. Should conflicts or impacts be observed, stipulations in the SUP may be modified or added to minimize these conflicts, or the activity may be terminated.

SIGNATURE: Refuge Manager: _____
(Signature/Date)

CONCURRENCE: Regional Chief: _____
(Signature/Date)

FIVE-YEAR REEVALUATION DATE: _____

BIBLIOGRAPHY:

Banks, P.B., and J.V. Bryant. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. Biology Letters 3:611-613.

George, S.L., and K.R. Crooks. 2006. Recreation and large mammal activity in an urban nature reserve. Biological Conservation 133(1):107-117.

Lafferty, K.D. 2001. Birds at a southern California beach: seasonality, habitat use and disturbance by human activity. Biodiversity and Conservation 10:1949-1962.

Langston, R.H.W., D. Liley, G. Murison, E. Woodfield, and R.T. Clarke. 2007. What effects do walkers and dogs have on the distribution and productivity of breeding European nightjar (*Caprimulgus europaeus*)? Ibis 149(Supplement):27-36.

Lenth, B.E., R.L. Knight, and M.E. Brennan. 2008. The effects of dogs on wildlife communities. Natural Areas Journal 28(3):218-227.

Lord, A., J.R. Waas, J. Innes, and M.J. Whittingham. 2001. Effects of human approaches to nests of northern New Zealand dotterels. Biological Conservation 98:233-240.

Miller, S.G., R.L. Knight, and C.K. Miller. 2001. Wildlife Responses to Pedestrians and Dogs. Wildlife Society Bulletin 29(1):124-132.

Nol, E., and R.J. Brooks. 1982. Effects of predator exclosures on nesting success of killdeer. Journal of Field Ornithology 53(3):263-268.

Reed, S.E., and A.M. Merenlender. 2008. Quiet nonconsumptive recreation reduces protected area effectiveness. Conservation Letters 1(3):146-154.

Sime, C.A. 1999. Domestic Dogs in Wildlife Habitats. Pp. 8.1-8.17 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Taylor, E.C., R.E. Green, and J. Perrins. 2007. Stone curlews (*Burhinus oedicnemus*) and recreational disturbance: developing a management tool for access. Ibis 149(Supplement):37-44.

U.S. Fish and Wildlife Service (USFWS). Service Manual Chapter 631 FW 5, Field Trials.

603 FW 1
Exhibit 1

Finding of Appropriateness of a Refuge Use

Refuge Name: Carlton Pond Waterfowl Production Area

Use: Boating

This exhibit is not required for wildlife-dependent recreational uses, forms of 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?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(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?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

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_X_ 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__X__**

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: Carlton Pond Waterfowl Production Area

Use: Boating

Narrative

Boating is an historic use of Carlton Pond Waterfowl Production Area (WPA) that occurred before the WPA was created. Hunting, fishing, wildlife observation and photography, and environmental education and interpretation are the six priority public uses of the National Wildlife Refuge System (Refuge System). The Refuge System Improvement Act of 1997 instructs refuge managers to seek ways to accommodate those six uses. Motorized and non-motorized boating is an appropriate means of facilitating these priority public uses on the WPA since much of the WPA is only accessible by water. Jet skis would not be permitted on WPA waters due to their environmental impact, noise, speed, and excessive wildlife disturbance. There are currently no motor or speed limitations since boats access is limited to hand-carry sites. The use has been allowed on the WPA since it was established with no significant adverse effects observed. U.S. Fish and Wildlife Service staff would continue to monitor the use and could implement both motor and speed limitations if wake or speeds become harmful to wildlife or habitat, or in the interest of public safety.

By allowing this use, we are providing opportunities and facilitating WPA programs in a manner and location that offer wildlife-dependent recreation and maintains the level of current fish and wildlife values. For these reasons, we have determined that allowing this use is consistent with the U.S. Fish and Wildlife Service policy on the appropriateness of refuge uses.

COMPATIBILITY DETERMINATION

USE: Boating

REFUGE NAME: Carlton Pond Waterfowl Production Area

DATE ESTABLISHED: November 24, 1965

ESTABLISHING AUTHORITIES:
Carlton Pond Waterfowl Production Area (WPA) was authorized by administrative action on July 15, 1964. The WPA was officially established when the first parcel was acquired on November 24, 1965. It was established under the following legislative authorities:

1. Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718c)

2. Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d)

PURPOSE(S) FOR WHICH ESTABLISHED:

1. "…as Waterfowl Production Areas" subject to "…all the provisions of such Act [Migratory Bird Conservation Act] …except the inviolate sanctuary provisions…" ((16 U.S.C. 718c) (Migratory Bird Hunting and Conservation Stamp Act)).

2. "…for any other management purpose, for migratory birds." ((16 U.S.C. 715d) (Migratory Bird Conservation Act)).

MISSION OF THE NATIONAL WILDLIFE REFUGE SYSTEM:
"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." (16 U.S.C. 668(dd) and (ee)) (National Wildlife Refuge System Administration Act of 1966)

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?
The use is motorized and non-motorized boating. Motorized and non-motorized boating are not a priority public use of the National Wildlife 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, however, they facilitate priority public uses.

Refuge visitors use non-motorized canoes, motorized canoes, and other small boats on Carlton Pond WPA waterways to access otherwise inaccessible portions of the waterfowl management area. Some visitors use these activities to support participation in fishing, hunting, environmental education, wildlife photography, and wildlife observation.

(b) Where would the use be conducted?
Motorized and non-motorized boating would be allowed on all open waters of Carlton Pond WPA.

(c) When would the use be conducted?
Motorized and non-motorized boating would be allowed year round, when waters are ice-free, from sunrise to sunset, and one hour before and after sunset in support of hunting.

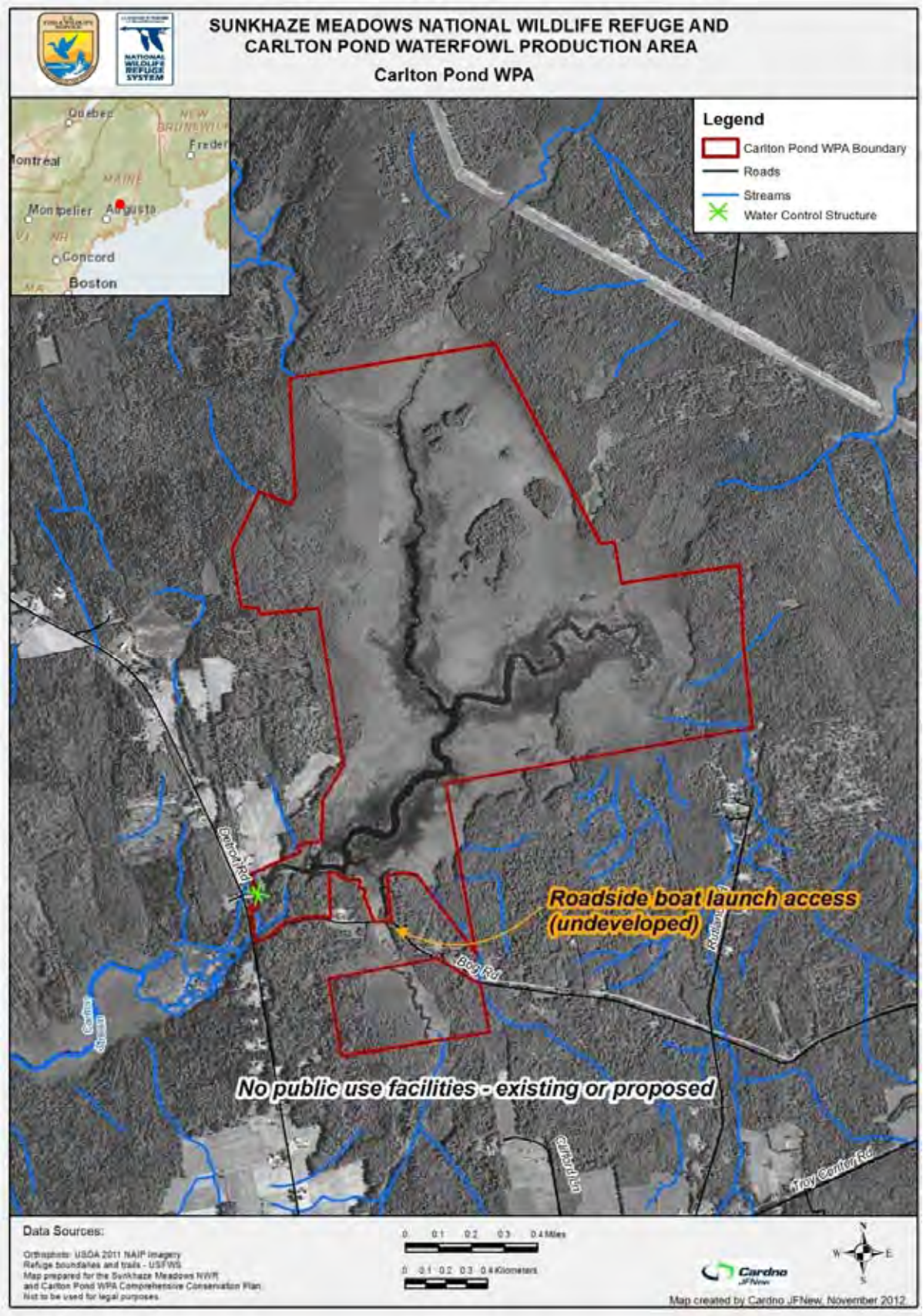
(d) How would the use be conducted?
Motorized and non-motorized boating would be conducted consistent with refuge and State regulations, with some additional restrictions to protect fish, wildlife, and habitat, and to reduce potential conflicts among public uses.

Hand-carry boat access is available at a number of locations both on and off Service-owned lands around Carlton Pond WPA. A car-top boat launch is located on Bog Road where it crosses a finger of Carlton Pond (see map B.30). All boats launched or landed on refuge lands must follow State boating regulations and, if applicable, show registration.

Maine Statute Title 38: 419B-420 prohibits the transport of any aquatic plant or parts of any aquatic plant, including roots, rhizomes, stems, leaves or seeds, on the outside of a vehicle, boat, personal watercraft, boat trailer or other equipment on a public road. Boaters should inspect all watercraft and clean off any aquatic invasive species before and after launching at WPA sites. That cleaning should take place on dry ground well away from the water. Nonnative, invasive plants or animals on boats, trailers, diving equipment, or in bait buckets can disrupt aquatic ecosystems and negatively affect native fish and plant species. Carlton Pond and its associated brooks and streams appear to be relatively free of aquatic invasive plants, and cleaning boats, trailers, and other equipment would help to keep them that way. Small areas of purple loosestrife have been found on Carlton Pond WPA and cleaning of boats will help reduce the chance of spreading loosestrife to new wetlands. Signs, public outreach, and periodic enforcement would help educate and remind the public of the importance of inspecting and cleaning watercraft and Maine State laws prohibiting transport of aquatic plants.

(e) Why is the use being proposed?
Motorized and non-motorized boating are existing uses at Carlton Pond WPA. These uses have been ongoing for many years with little or no observed adverse impacts to refuge habitats or wildlife. In addition, these uses also help facilitate the six priority public uses of the Refuge System: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. By allowing this use, we are providing opportunities and facilitating Service programs in a manner and location that offer wildlife-dependent recreation and maintain the level of current fish and wildlife values. Most of Carlton Pond would be inaccessible to the public without using a boat.

Map B.30. Location of undeveloped boat launch at Carlton Pond WPA.



AVAILABLITY OF RESOURCES:

Facilities or materials needed to support boating include periodic law enforcement patrol, biological monitoring, and educational outreach signage.

Law Enforcement Patrol	$3,000.00
Biological Monitoring/resource impact monitoring	$2,000.00
Educational Signage	$ 600.00
Program Cost:	**$5,600.00**

ANTICIPATED IMPACTS OF THE USE:

Because Carlton Pond and its tributaries have limited access for motorized and non-motorized boats, we do not expect a dramatic change from existing conditions. Currently boat and motor size is limited because no launch ramp is available for larger boats; therefore, all boats must be hand-carried to the water. The use is further restricted by seasonal low water levels and dense emergent vegetation around the edges of the pond and bank of its tributaries. In the past 2 years, Service law enforcement patrols have observed consistent low levels of use. Potential impacts of motorized and non-motorized boating include the following:

Accidental introduction of invasive plants, pathogens, or nonnative invertebrates, attached to fishing boats: With the exception of a few isolated occurrences of purple loosestrife, Carlton Pond appears to be relatively free of invasive aquatic plants and mollusks. However, we have not carried out extensive surveys for aquatic invasives. We can mitigate the potential for introductions by educating and encouraging boaters to clean their boats before launching and after retrieving. We would also post launch sites with educational materials and have law enforcement officers make courtesy spot checks of vessels and to educate boaters on proper methods for checking for aquatic hitchhikers.

Disturbance of wildlife (particularly breeding and brood-rearing black terns, waterfowl, and wading birds): Boating seasons in Maine coincide in part with spring and early summer nesting and brood-rearing periods for many species of aquatic birds. Anglers and other boaters may disturb nesting birds by approaching too closely to nests, causing nesting birds to flush. Flushing may expose eggs to predation or cooling, resulting in egg mortality. If this becomes a problem we would close refuge areas seasonally to boating around sensitive nest sites, in conjunction with the State of Maine if necessary. Though motorized boats generally have a greater impact on wildlife, even non-motorized boats can alter distribution, reduce use of particular habitats by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). However, compared to motorboats, canoes and kayaks appear to cause fewer disturbances to most wildlife species (Delong 2002). Most boating at Carlton Pond WPA is non-motorized, and based on 2 years of weekly law enforcement patrols, this use occurs at very low numbers which minimizes potential impacts.

Negative impacts on water quality from motorboat and other pollutants, human waste, and litter: Extensive water quality testing at Carlton Pond and its tributaries has not been carried out. The actual levels of pollutants from boat fuel and impacts on local aquatic systems are unknown.

Hydrocarbon contamination can be harmful to fish. Currently most boating is non-motorized so we believe there is little contamination coming from this source. We would initiate public outreach and education on littering, pollutants, and proper waste disposal if the use increases substantially above current use levels to help mitigate potential adverse impacts to water quality. Water quality testing would be carried out, dependent on staff and funding.

Bank erosion from human activity (boat landings, boat wakes) may increase aquatic sediment loads of streams and rivers, or alter riparian or streamside habitat and vegetation in ways harmful to fish or other wildlife. Boat access would be restricted to designated areas only. Access sites would be located near existing roads and access points, away from sensitive areas. The majority of boat use that occurs on Carlton Pond is non-motorized, primarily canoes and kayaks. When motorboats are used, they are either low horsepower or electric trolling motors; therefore, we do not anticipate any bank erosion due to boat wakes.

Negative impacts from fishing boats and foot traffic to sensitive wetlands and rare wetland plants. Boat access sites would be located away from sensitive wetlands, and rare plants.

Conflicts between boaters and other user groups: We know that a small number of conflicts among boaters and other users have arisen at Carlton Pond in the past. In addition, local land owners have expressed concerns about trespass and vehicles parking in inappropriate places and the disposal of human waste by boaters. We may need to manage public use on the WPA and look into providing a designated parking area and sanitation facilities to minimize conflicts. That may include providing additional education and outreach, providing additional sanitary facilities, or creating zones to separate groups of users.

To summarize, our continued monitoring of invasive species and outreach at launching sites is necessary to minimize impacts on refuge habitats, plant, and wildlife communities. Monitoring would identify any actions needed to respond to new information and correct problems that may arise in the future. Boating would support the mission of the Refuge System by facilitating participation in the six priority public uses.

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation plan (CCP) process for Sunkhaze Meadows NWR and Carlton Pond WPA, this compatibility determination will undergo a review and comment period of at least 30 days concurrent with the release of our draft CCP and environmental assessment.

DETERMINATION (check one below):

This use is compatible ___x___

This use is not compatible _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Boating access areas would be designated and signed.
- Service staff would continue to monitor the refuge for the presence of threatened or endangered species and ensure that boat use has no significant impact on these species. If needed in the future, closure of areas would be coordinated with the State of Maine.
- Motor or speed limitations could be implemented if wake or speeds become harmful to wildlife or habitat, or in the interest of public safety.
- Jet Skis would not be permitted on WPA waters due to their environmental impact, noise, speed, and excessive wildlife disturbance.
- All users would be encouraged to inspect and clean boats, trailers, motors, and fishing gear for plant material prior to launching and after retrieval.
- Compliance with regulations and these stipulations would be achieved through education, signage, and law enforcement which would result in minimizing negative impacts to refuge habitat and wildlife.
- The WPA would be open to boating sunrise to sunset and access to any restricted areas would be enforced.

JUSTIFICATION:

While boating is not a priority public use of the National Wildlife Refuge System, it does facilitate priority public uses at Carlton Pond WPA.

Allowing boating at the WPA would not materially interfere with, or detract from, the mission of the National Wildlife Refuge System of the purposes for which the WPA was established. As listed in the purposes section of this compatibility determination, the WPA was established and subsequently land was acquired for two main purposes. Boating would not materially interfere with or detract from the WPA's purposes for several reasons. First, as discussed under the section on anticipated impacts above, boating is a use that supports wildlife-dependent priority public uses with minimal adverse impacts on refuge resources. Use by boaters, based on 2 years of weekly law enforcement patrols, is low and is expected to remain low. This is due largely to numerous other opportunities in the area. Second, waterfowl tend to congregate in emergent vegetation on the wetland edges away from the main waterway used by boaters, so minimal and temporary disturbance of waterfowl is anticipated from boating activity. Third, erosion of stream banks by wakes from motorized boats has not been observed since most boating is non-motorized and dense vegetation and thickly matted roots protect the wetland banks. Therefore, boating is consistent with the wildlife and habitat aspects of the WPA's purposes, the Service

policy on compatible uses, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System.

By supporting priority public uses, allowing this use supports CCP goals and objectives as described in the refuge's draft CCP and EA (USFWS 2013). This activity would not materially interfere with or detract from the mission of the Refuge System because of the limited impacts to WPA resources, it facilitates priority public uses, and the opportunity to attract visitors to the WPA and build support for the Refuge System.

Signature: Refuge Manager: _____
(Signature/Date)

Concurrence: Regional Chief: _____
(Signature/Date)

Mandatory 10-year Reevaluation Date: _____

BIBLIOGRAPHY

Bauer, H.G., H. Stark, and P. Frenzel. 1992. Disturbance factors and their effects on water birds wintering in the western parts of Lake Constance. Der Ornithologische Beobachter 89(2): 81-91.

Bouffard, S.H. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Trans. N. Am. Wildl. Nat. Resour. Conf. 47: 553-558.

Boyle, S.A., and F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: a review. Wildl. Soc. Bull. 13: 110-116.

DeLong, A. 2002. Managing visitor use and disturbance of waterbirds. a literature review of impacts and mitigation measures. Appendix L in: Stillwater National Wildlife Refuge Complex Final Environmental Impact Statement for the Comprehensive Conservation Plan and Boundary Revision, Volume 2. U.S. Department of the Interior, Fish and Wildlife Service, Region 1, Portland, OR. 114 pp.

Evenson, D., C. Hopkins, and G. Martz. 1974. Waterfowl and waterfowl hunting at Houghton Lake. Mich. Dep. Nat. Resour., Wildl. Div., Infor. Circ. 171, Lansing. 7pp.

Johnson, R.E. 1964. Fish and fowl. Pages 453-458 *in* J.P. Linduska, editor. Waterfowl tomorrow. U.S. Department of Interior, Fish and Wildlife Service. U.S. Government Printing Office, Washington, D.C.

Knight, R.L., and D.N. Cole. 1995. Wildlife responses to recreationists. Pages 51-70 *in* R.L. Knight and K.J. Gutzwiller, eds. Wildlife and recreationists: coexistence through management and research. Washington, D.C.: Island Press.

Korschgen, C.E., and R.B. Dahlgren. 1992. Human disturbances of waterfowl: causes, effects, and management. U.S. Fish Wildl. Leafl. 13.2.15: 8pp.

Mathews, G.V.T. 1982. The control of recreational disturbance. Chapter 42. Pages 325-330 *in* D.A. Scott, ed. Managing wetlands and their birds, a manual of wetland and waterfowl management. Proceedings 3rd Technical Meeting on Western Palearctic Migratory Bird Management, Biologishche Station Rieselfelder Münster, Federal Republic of Germany, 12-15 October 1982.

Reichholf, J. 1976. The influence of recreation activities on waterfowl. Pages 364-369 *in* M. Smart, editor. Proceedings of the International Conference on Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December 1974. International Waterfowl Research Bureau, Slimbridge (Glos), England.

Speight, M.C.D. 1973. Outdoor recreation and its ecological effects: a bibliography and review. Univ. College London, England, Discuss. Pap. Conserv. 4. 35pp.

U.S. Fish and Wildlife Service (USFWS). 1988. Final Environmental Assessment, Proposal to Establish Sunkhaze Meadows National Wildlife Refuge.

——— 1992. Sunkhaze Meadows National Wildlife Refuge Preliminary Station Management Plan.

——— 1993. Sunkhaze Meadows National Wildlife Refuge Annual Narratives 1989-1993. Unpublished reports in refuge files.

Appendix C

Bill Thompson, USFWS

Northern parula warbler.

Draft Wilderness Review

Introduction

As part of the Comprehensive Conservation Plan (CCP) process, the U.S. Fish and Wildlife Service (Service, we, our) conducted this wilderness review of Sunkhaze Meadows National Wildlife Refuge (NWR) and Carlton Pond Waterfowl Production Area (WPA). The purpose of a wilderness review is to identify and recommend to Congress lands and waters of the National Wildlife Refuge System (Refuge System) that merit inclusion in the National Wilderness Preservation System (NWPS). Wilderness areas are untrammeled, roadless, undeveloped, and natural. They also offer outstanding opportunities for solitude and primitive recreation. Only Federal lands can be considered for wilderness designation. Wilderness reviews are required elements of CCPs, 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 comply with the National Environmental Policy Act (NEPA) of 1969, including offering opportunities for public involvement.

Wilderness Review Process

The wilderness review process has three phases:

1. Inventory phase
2. Study phase
3. Recommendation phase

During the inventory phase, the wilderness review team identifies lands and waters that meet the minimum criteria for wilderness. These areas are called wilderness study areas. During the study phase, the team further evaluates each wilderness study area to determine whether or not to recommend it for wilderness designation. In particular, team members analyze the quality of the area's values (e.g., ecological, cultural, and spiritual), resources (e.g., wildlife, water, vegetation, minerals, and soils), and uses (e.g., habitat management and public use). They also evaluate the manageability of the area as wilderness and conduct a minimum requirements/tools analysis. During the final phase, the team decides whether or not to recommend any wilderness study areas to Congress for wilderness designation. If the team decides that any wilderness study areas merit wilderness designation, they report their recommendations to Congress in a wilderness study report. The wilderness study report is prepared after the final CCP has been signed. Any areas that are recommended for wilderness designation would be 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.

Phase I. Wilderness Inventory

Introduction

The wilderness inventory takes a broad look at the planning area to identify wilderness study areas. A wilderness study area is an area of undeveloped Federal land that retains its primeval character and influence, is without permanent improvements or human habitation, and also meets the minimum criteria for wilderness as identified in section 2(c) of the Wilderness Act of 1964 (16 U.S.C. 1131-1136, 78 Stat. 890; Public Law 88-577).

We began this phase by considering all of the lands and waters on Sunkhaze Meadows NWR and Carlton Pond WPA owned in fee by the Federal government. We identified five, separate contiguous blocks on Sunkhaze Meadows NWR and Carlton Pond WPA. We subdivided one block on the refuge's Sunkhaze Meadows Unit into two separate areas along a section of McLaughlin Road (which is used by refuge staff and hunters) and a powerline right-of-way.

Based on this analysis, we identified the following six blocks (maps C.1, C.2, and C.3):

1. Sunkhaze Meadows NWR—Sunkhaze Meadows Unit, area A
2. Sunkhaze Meadows NWR—Sunkhaze Meadows Unit, area B
3. Sunkhaze Meadows NWR—Sunkhaze Meadows Unit, area C
4. Sunkhaze Meadows NWR— Benton Unit
5. Sunkhaze Meadows NWR—Sandy Stream Unit
6. Carlton Pond WPA

Minimum Wilderness Criteria

Our next step was to identify wilderness study areas by evaluating each of the six blocks to see if they meet the following minimum wilderness criteria:

- Appear ***natural***.
- Provide for ***solitude or primitive recreation***.
- Are either a ***roadless*** area that meets the ***size*** criteria or a roadless island of any size.

Below we provide more detailed descriptions of each these criteria and table C.1 presents our evaluation of each of the six blocks against the minimum wilderness criteria based on the Wilderness Act and Service policy (610 FW 4).

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, and physiographic and vegetative characteristics were considered in the evaluation of naturalness.

The following factors were the primary considerations in evaluating naturalness:

A. Does the area appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable?

B. If present, are human impacts substantially unnoticeable in the unit as a whole?
C. Does the area contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity?
D. What are the physical impacts of refuge management facilities and activities?

Solitude or Primitive and Unconfined Recreation—A wilderness study area 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 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. Solitude and primitive unconfined recreation 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 experiencing solitude is not an option.

The following factors were the primary considerations in evaluating outstanding opportunities for solitude or primitive, unconfined recreation:

A. The area offers the opportunity to avoid sights, sounds, and evidence of other people. A visitor to the area should be able to feel alone or isolated.
B. The area offers non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport.

Roadless—Roadless refers to the absence of improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use. A route maintained solely by the passage of vehicles does not constitute a road.

The following factors were the primary considerations in evaluating the roadless criteria:

A. The area does not contain improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use.
B. 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.
C. 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:

A. An area of more than 5,000 contiguous acres. State and private lands are not included in making this acreage determination.
B. 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.
C. 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.
D. 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 U.S. Department of Agriculture - Forest Service, National Park Service, or Bureau of Land Management.

Supplemental Value—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.

Summary of Wilderness Inventory Findings

Out of the six blocks we evaluated, only the Sunkhaze Meadows Unit, area A met all of the minimum wilderness criteria and qualified as a wilderness study area. The remaining five areas did not meet one or more of the minimum wilderness criteria and, therefore, did not qualify as wilderness study areas. We eliminated these blocks from further consideration for wilderness designation in this CCP. Please see chapter 2 of the Sunkhaze Meadows NWR and Carlton Pond WPA Draft Comprehensive Conservation Plan and Environmental Assessment (draft CCP/EA) for detailed descriptions of habitats and facilities at Sunkhaze Meadows NWR and Carlton Pond WPA (USFWS 2012).

Phase II. Wilderness Study

In this phase, we further evaluated the Sunkhaze Meadows Unit, area A wilderness study area to determine its suitability for designation, management, and preservation as wilderness. This evaluation considered the following:

- The area's quality of wilderness values
- The refuge's capability for managing the refuge as wilderness ("manageability")

Table C.1. Wilderness Inventory for Sunkhaze Meadows NWR and Carlton Pond WPA

		Minimum Wilderness Criteria				
	Size in acres	**(1) Has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unconfined condition, or is a roadless island?**	**(2) Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticed?**	**(3) Has outstanding opportunities for solitude or for a primitive and unconfined type of recreation?**	**(4) Contains ecological, geological or other features of scientific, scenic, or historical value?**	**Qualifies as a Wilderness Study Area by meeting all minimum wilderness criteria?**
Sunkhaze Meadows Unit, Area A	9,897 acres	**Yes**	**Yes**	**Yes**	**Yes** Has exemplary natural communities (domed bog, northern white cedar woodland fen, unpatterned fen, and silver maple floodplain forest) and is in an area with a high likelihood for containing cultural resources.	**Yes**
Sunkhaze Meadows Unit, Area B	1,566 acres	**No**	**Yes**	**No**	**Yes -** in an area with a high likelihood for containing cultural resources.	**No**
Sunkhaze Meadows Unit, Area C	20 acres	**No**	**No**	**No**	**Yes -** in an area with a high likelihood for containing cultural resources.	**No**
Benton Unit	334 acres	**No**	**No**	**No**	**No**	**No**
Sandy Stream Unit	58 acres	**No**	**No**	**No**	**No**	**No**
Carlton Pond WPA	1,068 acres	**No**	**No**	**Yes**	**No**	**No**

Quality of Wilderness Values

Size

The 9,897-acre Sunkhaze Meadows Unit, area A wilderness study area exceeds the size criteria of 5,000 contiguous acres.

Roadless

The wilderness study area meets the roadless criteria as it does not contain any improved roads. However, the study area is bounded by improved roads along all sides. It is bounded to the west by McLaughlin Road and a powerline right-of-way, to the south and east by County Road, and to the north by Stud Mill Road. McLaughlin Road is a one-lane, dirt road that is only used by refuge staff and hunters. County Road is a two-lane, public road that is partially paved and partially dirt. Stud Mill Road is a wide, two-lane, gravel road that is well maintained. Stud Mill Road is privately owned, but open to the public except for some storm events and during mud season (usually March through May).

Naturalness

The wilderness study area generally appears natural, is mostly free of human impacts, and does not contain any significant hazards caused by humans. Nearly all of the wilderness study area is covered by natural vegetation. The Sunkhaze Stream runs through the middle of the study area and is surrounded by wet grassland habitat. The rest of the study area is mostly forested wetlands, forested uplands, and peat bog habitat. There are also some scattered smaller ponds, bogs, and beaver marshes.

However, the study area does have some human impacts which may somewhat detract from the study area's "naturalness." These include the following:

1. There are a variety of public use facilities located in the study area, including several refuge trails, informational kiosks, and signs. The Johnson Brook Trail includes sections of boardwalk. There is also a raised wildlife viewing platform located on the Carter Meadows Trail which is visible from the bog and Sunkhaze Stream. Currently, all of the trails allow hiking, snowshoeing, and cross-country skiing.
2. The refuge currently allows two forms of motorized recreational uses in the study area, which are generally prohibited in wilderness areas:
   - Motorized boating on Sunkhaze Stream
   - Snowmobiling along the ITS 84 Trail (a portion of this trail runs along the western border and through the southwest corner of the study area).
3. There are several buildings in the study area that are used by refuge staff and the refuge Friends Group to store equipment and supplies. There is also one private cabin, which predates refuge establishment, on leased refuge land. These buildings currently use electricity.
4. There are a few sites in the wilderness study area that were previously actively managed as early successional habitat. Although these few areas have clear and obvious signs of human impact, they are scattered and small. Additionally, we do not anticipate

management for early successional habitat in these areas and over time they are expected to naturally convert to forest.

Outstanding Opportunities for Solitude and Primitive Recreation

The wilderness study area has outstanding opportunities for primitive recreation. The refuge currently offers a variety of non-motorized, dispersed outdoor recreation activities that do not require developed facilities or mechanical transport in the wilderness study area. These activities include nature photography, walking and hiking, snowshoeing, cross-country skiing, non-motorized boating (canoeing and kayaking), hunting, trapping, and fishing. In particular, the wilderness study area offers excellent opportunities for unconfined non-motorized boating, fishing, hunting, and snowshoeing.

Although the wilderness study area does offer some opportunity for solitude, these opportunities are relatively limited and not outstanding. It is generally difficult to avoid sights, sounds, and evidence of other people in the wilderness area for several reasons. First, much of the wilderness area's interior is forested wetlands, stream habitat, and peat bog. Because these habitats are difficult to hike through, the majority of hiking opportunities are located along the periphery of the wilderness area. Since the wilderness area is bounded by roads and adjacent to residential developments, it would be difficult for hikers to avoid the sights and sounds of humans. Second, snowmobiling and motorized boating are currently allowed in designated areas of the wilderness study and may be seen or heard by other users. Lastly, the refuge is located less than 20 miles from Bangor International Airport and there is some discussion of turning the Stud Mill Road (along the northern boundary of the refuge) into a major State highway. While not within the wilderness study area, these sights and sounds would be apparent from the wilderness study area, and could affect the sense of solitude and wilderness characteristics.

The only potentially outstanding opportunity for solitude in the wilderness study area is non-motorized boating (including fishing from non-motorized boats). Since Sunkhaze Stream runs through the center of the wilderness area, non-motorized boaters on the stream have a greater chance of feeling alone and isolated. However, along the edges of the wilderness area, non-motorized boaters would be close to roads and human development. Also, motorized boating currently occurs on Sunkhaze Stream. For non-motorized boaters to experience outstanding solitude, motorized boating would need to be eliminated.

Supplemental Values

The wilderness study area has several important ecological and cultural values. It contains four exemplary natural communities: domed bogs, northern white cedar woodland fen, unpatterned fen, and silver maple floodplain forest. It also contains portions of a deer overwintering area, as mapped by the Maine Department of Inland Fisheries and Wildlife. According to the Maine Historic Preservation Commission, the region around the refuge has a high potential for pre-European Native American archaeological sites (pers. comm., Arthur Speiss, MHPC, 2011). Archaeological excavations near the refuge have found evidence of human occupation from 8,500 to 5,000 years ago (Robinson 2012). Although there have been no systematic cultural resource surveys of Sunkhaze Meadows NWR, it is likely that the study area contains archaeological and historical sites.

Manageability Analysis

Being able to manage an area as wilderness is one of the criteria we evaluate when determining whether all or part of a wilderness study area is suitable for wilderness designation. We must be reasonably certain that we can manage the study area to maintain wilderness character over the long term before designated it as wilderness. In order to analyze the manageability of the Sunkhaze Meadows Unit, area A wilderness study area, we considered the following:

- Existing private rights, including the type, extent, and validity of private rights in the wilderness study area.
- Land status and Service jurisdiction, including whether or not the Service has adequate jurisdiction over the wilderness study area to ensure maintenance of its wilderness character.
- Current and planned refuge management activities and refuge uses, including
  - if these activities and uses involve or require the use of generally prohibited uses;
  - how the continuation or implementation of these activities and uses affect our ability to manage the area as wilderness; and
  - if we could modify or eliminate these activities and uses to improve our ability to manage the area as wilderness while still accomplishing refuge purposes.

Existing Private Rights

According to our records, the Service owns all existing rights in the study area, there should be no conflicts with third part rights.

Land Status and Service Jurisdiction

The refuge owns all of the wilderness study area in fee title.

Current and Planned Refuge Management Activities and Refuge Uses

Some of our current and proposed management activities and recreational opportunities are prohibited in wilderness areas or may require the use of mechanized tools. If the wilderness study area were designated as wilderness, we would need to eliminate these activities and uses or redraw the boundary for the wilderness area to exclude the areas where these activities and uses take place.

Motorized Boating and Snowmobiling

We currently permit motorized boating and snowmobiling on designated portions of the refuge. Both of these uses are usually prohibited in wilderness areas because they involve motorized transport. Snowmobiling is specifically mentioned as being permitted on the refuge at appropriate times or in places where no conflict would occur with the objectives of the Refuge System in the 1988 Environmental Assessment establishing the refuge (USFWS 1988). Because of this, we do not believe it should be eliminated from the entire wilderness study area. Since snowmobiling only occurs on a small portion of the wilderness study area, the boundary of the wilderness study area could be adjusted to eliminate the snowmobile trail.

It would be difficult to completely eliminate motorized boating. There are no natural landmarks that could be used to denote the boundary of the proposed wilderness study area. The stream cannot be used as the boundary marker because it floods extensively, particularly in the spring. Based on comments from refuge visitors, spring is also the time when most motorized boating

occurs on the refuge. In spring, the stream floods sections of peat bog and forested wetlands which creates a large lake. During flooding, the stream channel is not visible. It is difficult to place and maintain boundary signs within these flooded areas for a variety of reasons. First, the peatland consists of poorly drained organic soils of peat and muck (Thompson and Born 1986). Each year the peat freezes and thaws. In just a few years, this would cause sign posts to lean and eventually fall over, causing them to be submerged when the stream is flooded. To avoid this, post holes would need to be more than 10 feet deep since the peat thickness ranges from 10 to 15 feet deep (USFWS 2001). We estimate that we would need to post and maintain signs along up to 4.5 miles within the peatland soils. This would be logistically difficult and would divert limited resources away from managing refuge habitat and priority public uses. Without posted signs, it would be difficult to enforce a ban on motorized boating in the wilderness study area because motorized boating would still occur on the portion of the stream outside of the refuge. Since the wilderness boundary and refuge boundary would be difficult to post, it would be nearly impossible for boaters to know when they are within or outside a wilderness area. Because boaters can legally access Sunkhaze Stream off the refuge, we do not believe that adjusting the wilderness boundary would address this issue.

Maintaining Refuge Trail System and Other Public Use Facilities

We currently use mechanized tools to maintain refuge trails, boardwalks, the observation platform, and other public use facilities in the wilderness study area. It would be difficult to manage these facilities using non-mechanized tools since Sunkhaze Meadows NWR is unstaffed and currently managed by staff from the Maine Coastal Islands NWR Complex, as time and resources permit. Boardwalks are important for providing access and protecting sensitive wetland habitats on the refuge. We do not believe we could completely eliminate the refuge trail system and other public use facilities in the entire wilderness study area because they are important to achieving refuge purposes and goals related to providing wildlife-oriented recreational opportunities. It is possible to adjust the wilderness study area boundary to exclude most of these areas.

Maintaining Storage Buildings

We currently maintain several buildings in the wilderness study area. The refuge's Friends Group and staff use these buildings for storage and they require the use of electricity. We believe these buildings are important to achieving refuge purposes because they store materials and equipment for our habitat management and public use programs, and help support activities (including interpretive programs) of the refuge's Friends group. There is also a privately owned cabin within the study area. The previous property owner authorized the use of the cabin, prior to Service acquisition. We have continued to allow the cabin owners to remain, for a fee, provided they meet certain stipulations. Given that Sunkhaze Meadows NWR is unstaffed, it would be difficult to maintain and operate these buildings without the use of mechanized tools and electricity. However, we could adjust the wilderness study area boundary to avoid the areas where these buildings are located.

Habitat Management

Designating wilderness would also reduce our flexibility to actively manage habitats in the study area. Although we currently conduct little active management in the study area, we are proposing to evaluate how to best manage several rare natural communities and a deer overwintering area

in the study area. Our analysis may determine that these habitats require active management using mechanized tools in order to help achieve the refuge's purposes and goals. Additionally, designating the study area as wilderness would reduce our flexibility to use mechanized tools to control invasive plant species. As mentioned above, since the refuge is managed by offsite staff from the Maine Coastal Islands NWR Complex, it would be difficult to actively manage large areas of habitat and control invasive species without the use of mechanized tools. Eliminating active habitat management in the entire wilderness study area may negatively impact our ability to achieve refuge purposes and goals related to habitat and wildlife management. Active habitat management could also conflict with the intent of the Wilderness Act to primarily allow natural processes to influence designated wilderness. At this time, we do not know which management actions might be best for maintaining or improving the rare natural communities within the study area. We may need to conduct experimental treatments and use adaptive management. Wilderness designation could impede or prevent us from implementing these treatments. However, it is possible to adjust the wilderness study area boundary to avoid most of the habitats that may require active management.

Overall, we believe it would be difficult to effectively manage the entire 9,897-acre Sunkhaze Meadows Unit, area A wilderness study area to maintain the wilderness character while achieving refuge purposes and the Refuge System mission.

Evaluation of Management Alternatives

Based on our manageability analysis, we developed three management alternatives: no wilderness, all wilderness, and partial wilderness. First we provide a brief description of the three alternatives. We then compare and contrast how the alternatives impact a variety of topics, including refuge purposes, the Refuge System mission, the purposes of the Wilderness Act (table C.2).

Description of the Management Alternatives

No Wilderness Alternative
Under this alternative, we would not recommend any portions of Sunkhaze Meadows NWR and Carlton Pond WPA for wilderness designation. We would manage both the refuge and waterfowl production area as described in the Service-preferred alternative in the draft CCP/EA.

All Wilderness Alternative
Under this alternative, we would recommend the entire 9,897-acre Sunkhaze Meadows Unit, area A wilderness study area (map C.1) to Congress for wilderness designation and inclusion in the NWPS. We would manage this area to preserve its wilderness values.

Partial Wilderness Alternative
Under this alternative, we would recommend about 7,090 acres of Sunkhaze Meadows Unit, area A wilderness study area (map C.4) to Congress for wilderness designation and inclusion in the NWPS. We would manage this area to preserve its wilderness values. For reasons described above under "Current and Planned Refuge Management Activities and Refuge Uses," this 7,090-acre section would exclude the following sections of the original Sunkhaze Meadows Unit, area A wilderness study area:

- The ITS 84 Snowmobile Trail and the area south of the trail in the southwest of the study area.
- The deer overwintering area, as mapped by the Maine Department of Inland Fisheries and Wildlife, in the northeast of the study area.
- The silver maple floodplain forest exemplary natural community, adjacent to the deer overwintering area.
- The Carter Meadows Trail (including observation platform), the Johnson Brook Trail, the Oak Point Trail, and the Ash Landing Trail.
- Several buildings, including storage buildings, located near the Carter Meadows Trail.

Summary of Wilderness Study Findings

After analyzing all three alternatives, we determined that the Sunkhaze Meadows Unit, area A wilderness study area is not currently suitable for wilderness designation under either the "All Wilderness" or "Partial Wilderness" alternatives. Our determination was based on the following major factors:

1. **It would be difficult to denote the boundary of the wilderness area, and therefore hard for visitors to know where the wilderness area is, to enforce restricted uses, and manage the area as wilderness**. Because of seasonal flooding of Sunkhaze Stream and the lack of other natural landmarks, it would be difficult to denote the boundary under both the "All Wilderness Alternative" and the "Partial Wilderness Alternative."

2. **It would be difficult to manage and maintain the trails, boardwalks, and buildings in the wilderness study area without the use of mechanized tools.** The refuge is currently unstaffed and is administered by staff from the Maine Coastal Islands National Wildlife Refuge Complex, located about 2 hours away. It would be difficult for staff members to maintain all of the refuge trails, boardwalks, and buildings without the use mechanized tools. Under the "Partial Wilderness Alternative," this would be less of an issue because the potential wilderness area would exclude most of the buildings, trails, boardwalks, and other public use infrastructure.

3. **It may be difficult to achieve management objectives for rare habitat types in the wilderness study area.** Botanical inventories and rare plant surveys conducted by refuge staff and the Maine Natural Heritage Program (MNHP) have documented several exemplary communities and rare plants within the wilderness study area. One of the exemplary natural communities is the northern white cedar seepage forest. The best management techniques to maintain or improve the biological diversity, integrity, and environmental health for this habitat are currently unknown. This habitat may require active management, including experimental methods and adaptive management. This would be difficult to implement under the "All Wilderness" alternative. Under the "Partial Wilderness Alternative," this would be less of an issue because the potential wilderness area would exclude most of the northern white cedar seepage forest. It could become a problem if this habitat expanded into the partial wilderness area.

Table C.2. Comparison of the Management Alternatives

Impacts of Each Alternative on…	**No Wilderness Alternative**	**All Wilderness Alternative**	**Partial Wilderness Alternative**
Wilderness values[1]	Maintains existing wilderness values.	May enhance wilderness values on 9,897 acres by eliminating motorized boating and snowmobiling, and forgoing active management of habitats and recreational facilities.	May enhance wilderness values on 7,090 acres by eliminating motorized boating.
Refuge resources	Retains flexibility to actively manage.	Reduces flexibility to enhance habitats and public use facilities on 9,897 acres including the deer overwintering area, the silver maple floodplain forest exemplary natural community, and refuge trail system.	Reduces flexibility to enhance habitats and public use facilities on 7,090 acres, but retains the flexibility for active management in the deer overwintering area, the silver maple floodplain forest exemplary natural community, and refuge trail system.
Achieving the purposes of the Wilderness Act and National Wilderness Preservation System[2]	None of the refuge would be specifically managed to achieve the purposes of the Wilderness Act. However, we would manage the wilderness study area in a way that would likely maintain much, if not all, of the area's existing level of wilderness character.	Most likely to achieve the purposes of the Wilderness Act by managing 9,897 acres to protect, preserve, and enhance wilderness character.	Likely to achieve the purposes of the Wilderness Act by managing 7,090 acres to protect, preserve, and enhance wilderness character.
Achieving refuge or unit purposes	Most likely to achieve the purposes of the refuge by allowing the flexibility to actively manage habitats and maintain public use facilities and trails.	Reduces flexibility to enhance habitats and public use facilities on 9,897 acres including the deer overwintering area, the silver maple floodplain forest exemplary natural community, and refuge trail system.	Reduces flexibility to enhance habitats and public use facilities on 7,090 acres, but retains the flexibility for active management in the deer overwintering area, the silver maple floodplain forest exemplary natural community, and refuge trail system.
Contributing to the Refuge System Mission	Most likely to contribute to the Refuge System mission by allowing the flexibility to actively manage habitats and maintain public use facilities and trails.	Reduces flexibility to enhance habitats and public use facilities on 9,897 acres including the deer overwintering area, the silver maple floodplain forest exemplary natural community, and refuge trail system.	Reduces flexibility to enhance habitats and public use facilities on 7,090 acres, but retains the flexibility for active management in the deer overwintering area, the silver maple floodplain forest exemplary natural community, and refuge trail system.

Impacts of Each Alternative on…	**No Wilderness Alternative**	**All Wilderness Alternative**	**Partial Wilderness Alternative**
Maintaining and, where appropriate, restoring biological integrity, diversity, and environmental health	Retains the flexibility to actively manage and restore biological integrity, diversity, and environmental health, if deemed necessary.	Reduces our flexibility to actively manage and restore biological integrity, diversity, and environmental health on 9,897 acres, if deemed necessary.	Reduces our flexibility to actively manage and restore biological integrity, diversity, and environmental health on 7,090 acres, if deemed necessary, especially for identified rare natural communities.
Meeting other legal and policy mandates and prior refuge NEPA documents	Continues to allow snowmobiling, which was specifically mentioned as being permitted on the refuge in the 1988 Environmental Assessment establishing the refuge.	Prohibit snowmobiling, which was specifically mentioned as being permitted on the refuge, where compatible, in the 1988 Environmental Assessment establishing the refuge.	Continues to allow snowmobiling, which was specifically mentioned as being permitted on the refuge in the 1988 Environmental Assessment establishing the refuge. Difficult to manage different public uses at the potential border because of seasonal flooding, lack of natural landmarks, and difficulty in posting boundary.

[1] Wilderness values include biophysical (e.g., ecosystems, scenery, and natural processes), psychological (e.g., opportunity for solitude or primitive and unconfined recreation), symbolic (e.g., national and natural remnants of American cultural and evolutionary heritage), and spiritual (e.g., sense of connection with nature and values beyond one's self) values (601 FW 1.5JJ).

[2] The purposes of the Wilderness Act are: secure an enduring resource of wilderness; protect and preserve the wilderness character of areas within the National Wilderness Preservation System; administer the National Wilderness Preservation System for the use and enjoyment of the American people in a way that will leave these areas unimpaired for future use and enjoyment as wilderness; and gather and disseminate information regarding the use and enjoyment of wilderness areas (601 FW 1.8). Wilderness character is defined as: (1) maintaining the natural, scenic condition of the land; (2) providing environments for native plants and animals, including those threatened or endangered; (3) maintaining watersheds and airsheds in a healthy condition; (4) maintaining natural night skies and soundscapes; (5) retaining the primeval character of and influence on the land; (6) serving as a benchmark for ecological studies; and (7) providing opportunities for solitude, primitive and unconfined outdoor recreation, risk, adventure, education, personal growth experiences, a sense of connection with nature and values beyond one's self, a link to our American cultural heritage, and mental and spiritual restoration in the absence of urban pressures (601 FW 1.13).

4. **The 1988 Environmental Assessment establishing the refuge specifically mentions providing opportunities for snowmobiling, if compatible.** Snowmobiling is an existing use on the refuge and the 1988 Environmental Assessment explicitly states that snowmobiling would be permitted on the refuge at appropriate times or in places where it would not conflict with the objectives of the Refuge System. However, snowmobiling is usually prohibited in wilderness areas. We do not wish to discontinue offering snowmobiling along the ITS 84 Snowmobile Trail. Under the "Partial Wilderness Alternative," this would not be an issue because the potential wilderness area would exclude the snowmobile trail, as well as areas south of the trail.

5. **The comments we received during the public comment period were not supportive of designating wilderness on Sunkhaze Meadows NWR**. On February 9, 2012, we held a public meeting about the wilderness review process for Sunkhaze Meadows NWR. At the meeting, we solicited comments on the 7,090-acre partial wilderness study area considered under the "Partial Wilderness Alternative." The comments we received were generally unsupportive of proposing wilderness on the refuge.

We have finished the wilderness study process and will not recommend any refuge or waterfowl production area lands to Congress for inclusion in the NWPS at this time. We will reassess this determination during development of the next CCP in 15 years, or sooner if deemed appropriate.

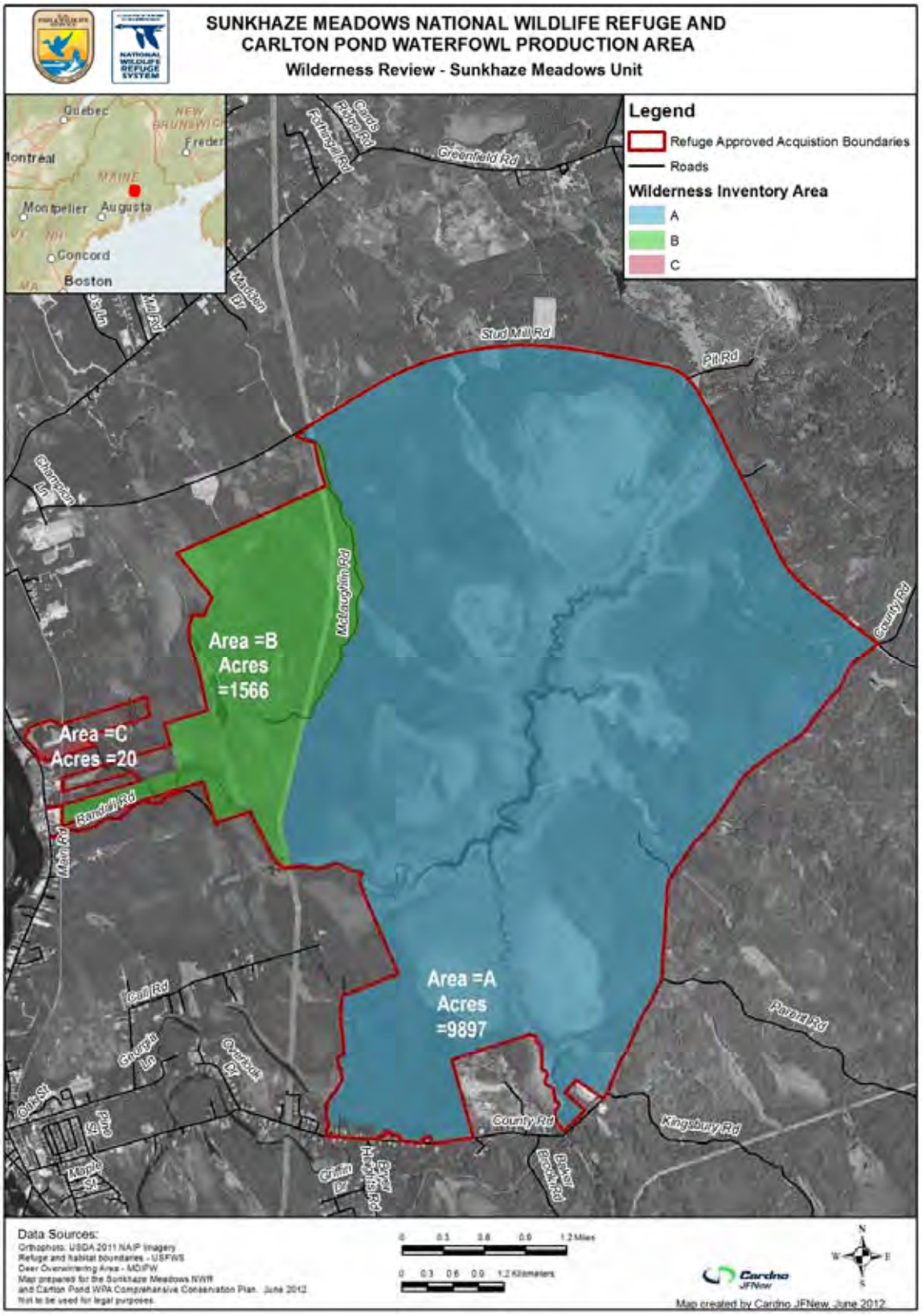
Literature Cited

Robinson, B. 2012. Cultural Resources of Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. Prepared for U.S. Fish and Wildlife Service, Region 5. Draft Report. March 2012. 114 pp.

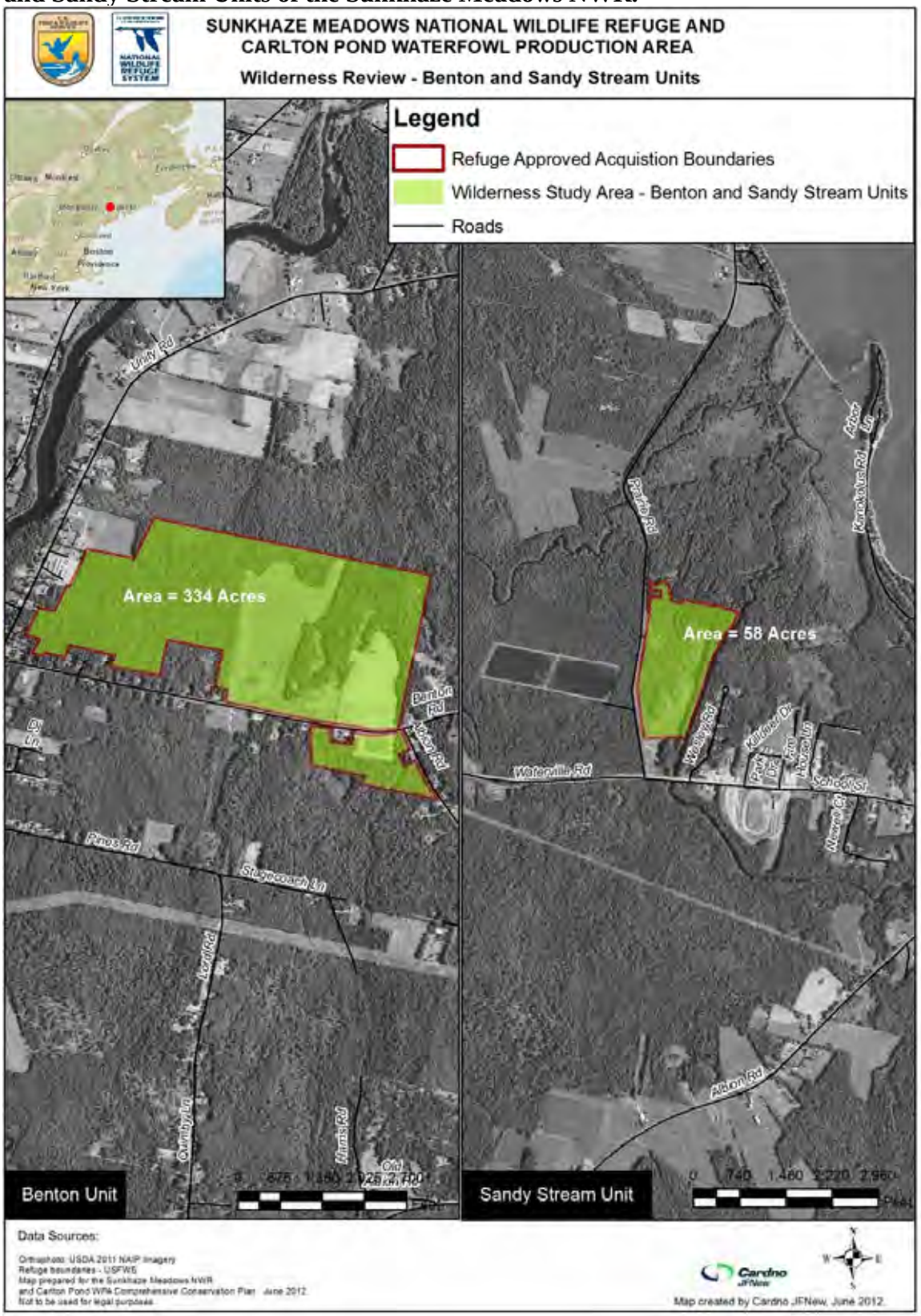
U.S. Fish and Wildlife Service (USFWS). 1988. Final Environmental Assessment, Proposal to Establish Sunkhaze Meadows National Wildlife Refuge, Penobscot County, Maine. U.S. Fish and Wildlife Service Region 5. 56 pp.

——— 2013. Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment. U.S. Fish and Wildlife Service, Maine Coastal Islands National Wildlife Refuge Complex, Rockland, ME.

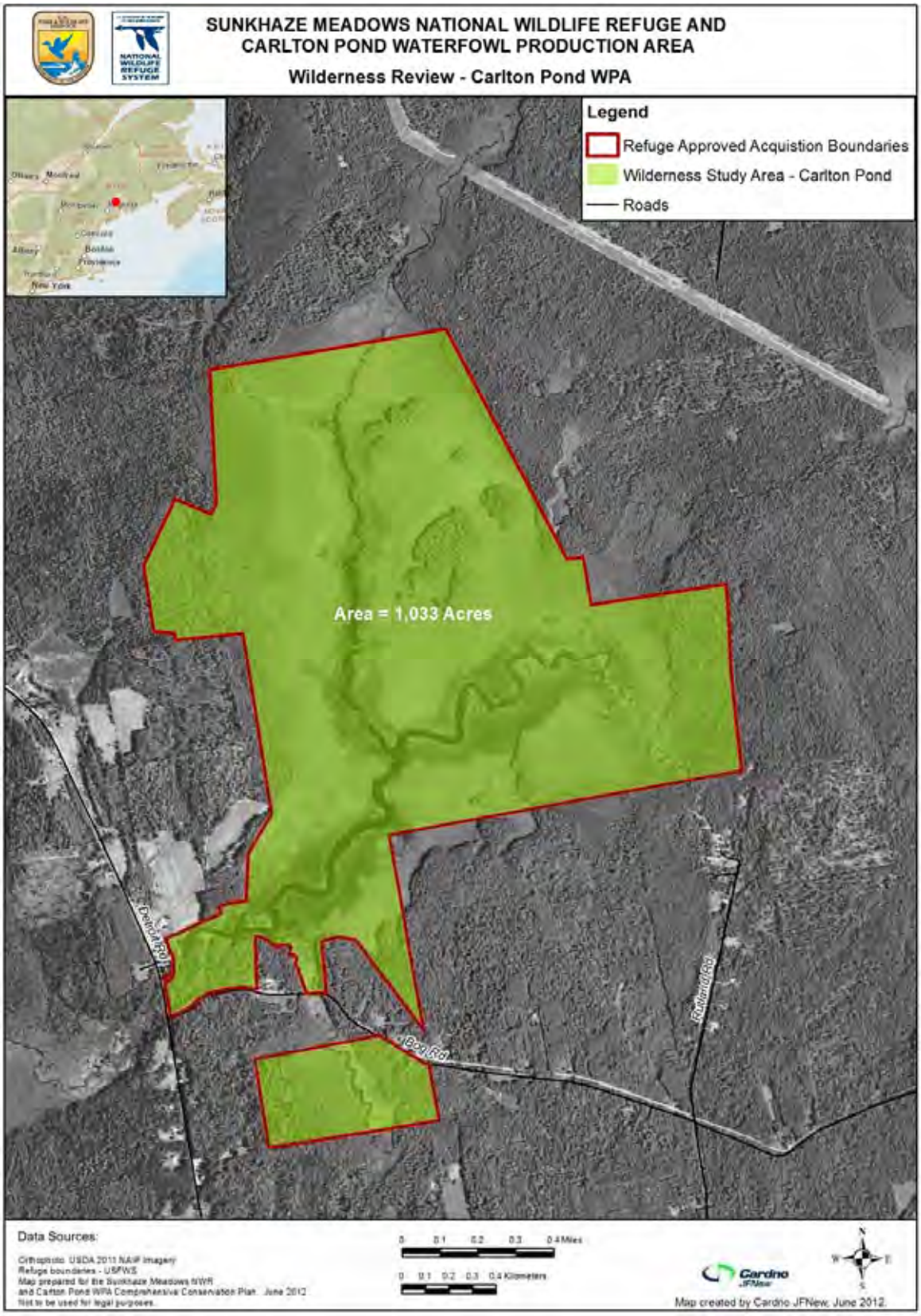
Map C.1. Areas Analyzed for Potential Inclusion in Wilderness Study Phase for the Sunkhaze Meadows Unit of the Sunkhaze Meadows NWR.



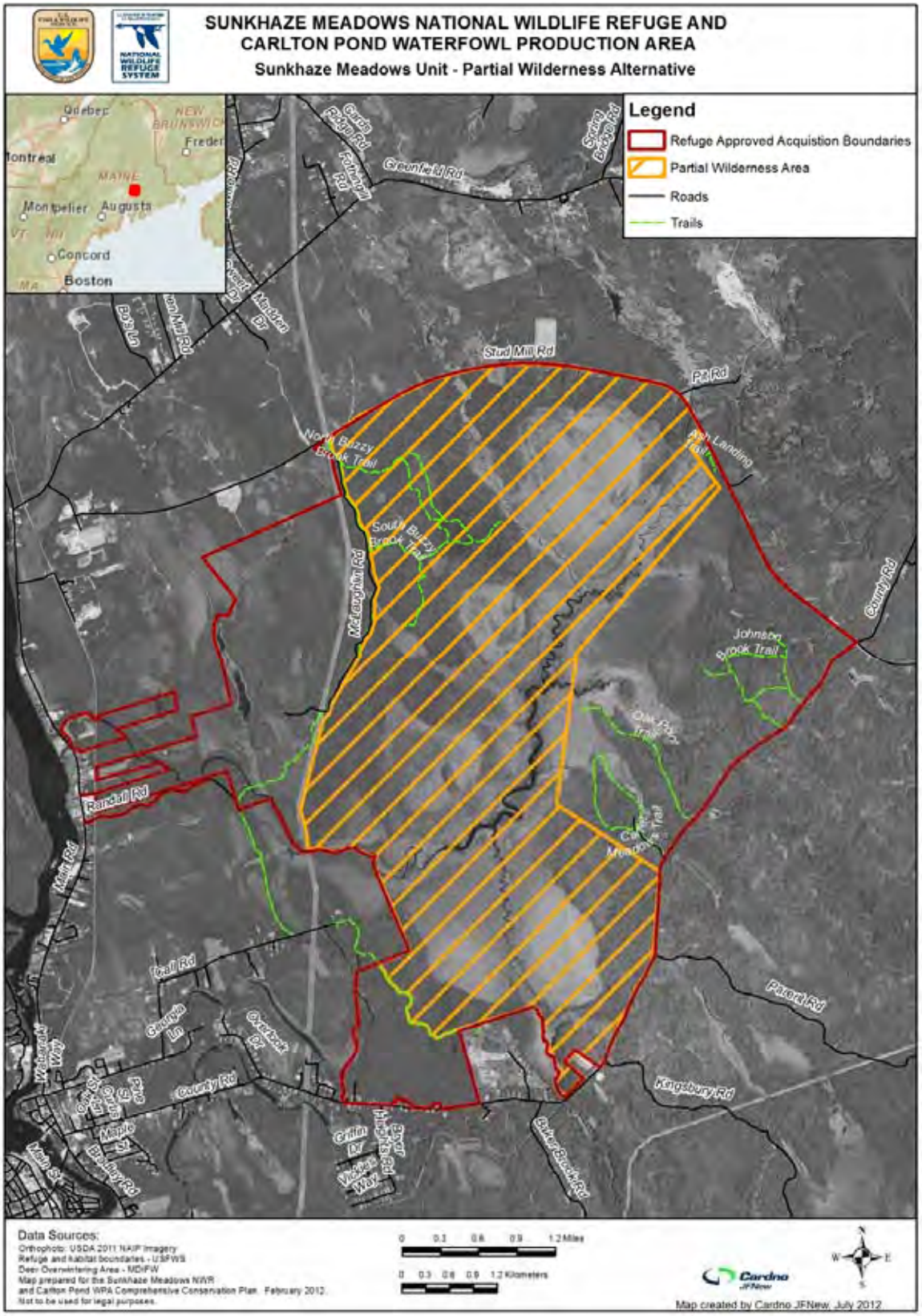
Map C.2 Areas Analyzed for Potential Inclusion in Wilderness Study Phase for the Benton and Sandy Stream Units of the Sunkhaze Meadows NWR.



Map C.3 Area Analyzed for Potential Inclusion in Wilderness Study Phase for Carlton Pond WPA.



Map C.4 Partial Wilderness Alternative Analyzed for Area A of the Sunkhaze Meadows Unit of the Sunkhaze Meadows NWR.



Appendix D

John and Karen Hollingsworth, USFWS

Service staff on Sunkhaze Stream at Sunkhaze Meadows National Wildlife Refuge

Draft Wild and Scenic River Review

Introduction

The Wild and Scenic Rivers Act (Public Law 90-543 as amended: 16 U.S.C. 1271-1287) established the National Wild and Scenic Rivers System (NWSRS) to provide federal protection for certain free-flowing rivers, preserving them and their immediate environments for the use and enjoyment of present and future generations.

The act requires Federal agencies to identify and evaluate potential additions to the NWSRS through their land and resource management planning processes. Section 5(d) (1) of this act states in part: "In all planning for the use and development of water and related land resources, consideration shall be given by all federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potential." Wild and scenic river considerations are a required element of comprehensive conservation plans (CCP) for national wildlife refuges, and are conducted in accordance with the refuge planning process outlined in 602 FW 1 and 3, including public involvement and National Environmental Policy Act (NEPA) compliance.

The scope of this wild and scenic rivers review is limited to inventory and tentative classification of the rivers, river segments, and their immediate environments within the Sunkhaze Meadows National Wildlife Refuge (NWR, refuge) and Carlton Pond Waterfowl Production Area (WPA) boundaries to determine eligibility. Eligible rivers will be studied at a later date to determine suitability for inclusion in the National Wild and Scenic Rivers System (NWSRS). Regardless, we do not expect the results of the review process, or designation if it occurs, to affect any of the existing public uses or proposed habitat management of Service lands or waters.

Wild and Scenic Rivers Review Process

As part of the Section 5(d) (1) review process, the U.S. Fish and Wildlife Service (Service, we, our) are required to evaluate all river segments that are within the planning area and listed in the Nationwide Rivers Inventory (NRI). The NRI is maintained by the National Park Service and lists more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance.

The Wild and Scenic Rivers Act defines a river as "a flowing body of water or estuary or section, portion or tributary thereof, including rivers, streams, crooks, runs, kills, and small lakes." When a river or river segment is determined to be potentially eligible through the wild and scenic rivers inventory process, its eligibility status is forwarded to the National Park Service (NPS) for inclusion into the NRI. The results of this inventory will be forwarded to NPS to update the NRI.

There are three steps in the wild and scenic rivers review process: eligibility, classification, and suitability. A river or stream is eligible if it is free-flowing and has at least one outstandingly remarkable value (ORV). The act identifies an ORV as recreational, geologic, fish and wildlife, historic, cultural, or other similar values. If we find a river or stream is eligible, we determine the appropriate classification. Classification is based on its condition at the time of study. Section 2(b) of the act provides guidance on classification. The act specifies three classification categories: wild river areas, scenic river areas, and recreational river areas (these are discussed in

more detail below under “Wild and Scenic Rivers Classification for Sunkhaze Meadows NWR and Carlton Pond WPA”).

During the third step, we conduct a suitability study to determine if the river or river segments that were found eligible are suitable for designation to the NWSRS. The act identifies the factors that will be considered and documented in determining the suitability of a river or river segment for inclusion in the NWSRS.

Section 4(a) of the act states that the study will include:

“ … maps and illustrations, …; the characteristics which do or do not make the area a worthy addition to the system; the current status of landownership and use in the area; the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the national wild and scenic rivers system; the federal agency … by which it is proposed the area, should it be added to the system, be administered; the extent to which it is proposed that such administration, including the costs thereof, be shared by state and local agencies; and the estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area, should it be added to the system…”

The study area covers each river or river segment and their immediate environment. The immediate environment is an area extending the length of the river or river segment being studied and extending in width 0.25 miles from each bank of the river.

The recommendation phase consists of forwarding the wild and scenic rivers study report from the Service Director to the Secretary, then onto the President, and finally to Congress. If the study phase is completed in conjunction with a CCP, the study report is prepared after the decision document for the final CCP has been signed. The river or river segments recommended for NWSRS designation are managed to maintain their character in accordance with management goals, objectives, and strategies outlined in the final CCP until Congress makes a favorable legislative determination or the CCP is amended to modify or remove the wild and scenic river proposal.

To help expedite the CCP process, we decided to defer the suitability study until after the CCP is completed. Our determinations of river eligibility and classifications assigned during this review are tentative, and are subject to further consideration during the suitability study. Once the study phase is completed, there will be one of two outcomes: a recommendation to designate suitable segments of stream under the Wild and Scenic Rivers Act, or a determination that there are no suitable stream segments and therefore we would not recommend designation at this time. If we determine that there are suitable segments, we would prepare a legislative environmental impact statement. This document, along with the results of the suitability study would be submitted to the Director of the Service, then to the Secretary of the Department of the Interior, then onto the President, and finally to Congress for potential designation. This is a long process and there are several opportunities for public involvement including commenting on this review when the draft CCP and environmental assessment (EA) are released. At this time, we do not know when we might be able to complete the suitability study. We expect it will be several years.

The Inventory Team

We established an inventory team to complete this review. The team was comprised of staff from the Service's Northeast Regional Office, Maine Coastal Islands National Wildlife Refuge Complex, and a retired Service employee. The members include the following:

- Beth Goettel, Refuge Manager, Maine Coastal Islands National Wildlife Refuge Complex
- Brian Benedict, Deputy Refuge Manager, Maine Coastal Islands National Wildlife Refuge Complex
- Michael Langlois, Wildlife Biologist, Maine Coastal Islands National Wildlife Refuge Complex
- Lia McLaughlin, Natural Resource Planner, Northeast Regional Office
- Margaret Engesser, Assistant Outreach Coordinator, Northeast Regional Office
- Barry Brady, (retired) Regional Wilderness Coordinator, Northeast Regional Office

We also shared drafts of this document for review and comment with members of the CCP planning team which includes representatives from Maine Department of Inland Fisheries and Wildlife, the Penobscot Indian Nation, and the town of Milford.

Phase I – Wild and Scenic Rivers Inventory

Introduction

The wild and scenic rivers inventory identifies rivers or segments of rivers and their immediate environment within the planning area that meet the minimum criteria for wild and scenic river eligibility under the act.

Minimum Wild and Scenic Rivers Criteria

A river, stream, or segment must meet both of the following criteria to be eligible for designation as a wild and scenic river:

- The river or river segment must be free-flowing.
- The river or river segment and its immediate environment must possess at least one ORV associated with the river or stream.

Outstandingly Remarkable Values

ORVs include scenic, recreational, geologic, fish and wildlife, historic, cultural, or similar values. The following definitions were taken from the joint U.S. Department of Agriculture-Forest Service and National Park Service technical report "The Wild and Scenic River Study Process" (Diedrich and Thomas 1999). These definitions are intended to set minimum thresholds for each ORV to help foster consistency across Federal river-administering agencies. These definitions are only illustrative and not comprehensive. Agencies may modify these criteria or include additional criteria to make them more meaningful in the area of comparison.

- **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.

    - Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.

    - 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 examples of geologic features, processes, or phenomena that is unique or rare within the region of comparison.

- **Fish:** Fish values can be based on the merits of fish populations, fish habitat, or a combination of the two.

    - **Population:** 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 federally listed 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."

    - **Habitat:** The river provides exceptionally high quality habitat for fish species native to the region of comparison. Of particular significance is habitat for wild stocks and/or federally listed 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 can be based on the merits of terrestrial or aquatic wildlife populations, habitat, or a combination of the two.

    - **Populations**: The river, or area within the river corridor, contains nationally or regionally important populations of native wildlife species. Of particular significance are species considered to be unique, and/or populations of federally listed 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."

    - **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 federally listed 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, these may include, but are not limited to, hydrological, paleontological, or botanical resources.

Wild and Scenic Rivers Classification for Sunkhaze Meadows NWR and Carlton Pond WPA

Each river or river segment eligible for inclusion in the NWSRS must be classified as either a wild, scenic, or recreational river. The act provides the following definitions:

- **Wild river areas** – 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 river areas** – 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 river areas** – 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.

Wild and Scenic Rivers Inventory Findings

Below is a summary of the inventory findings for all of the streams and stream segments within the boundaries for Sunkhaze Meadows NWR and Carlton Pond WPA.

River or Stream Segment: Fowler Brook and tributary (Benton Unit)

Length: 066 miles for Fowler Brook, 0.66 miles tributary
Outstandingly Remarkable Values: None
Tentative Classification: Not applicable

The Benton Unit is one of three units that comprise the Sunkhaze Meadows National Wildlife Refuge, and is located near the town of Unity, in Waldo County, Maine. This unit is bordered by roads and agricultural lands on two sides and forested habitat on the other two sides. One stream segment on refuge lands goes through the center of the unit, primarily the grassland habitat. The other stream segment follows the eastern edge of the unit and is bordered by forest. Both stream segments are small, and neither segment contains any ORVs as defined above. For this reason, we have determined that these segments are not eligible for designation as wild or scenic under the Wild and Scenic Rivers Act.

River or Stream Segment: Carlton Pond (Carlton Pond WPA)
Length: not applicable
Outstandingly Remarkable Values: None
Tentative Classification: Not applicable

Carlton Pond WPA is located near the town of Unity, in Waldo County, Maine. Carlton Pond is an impounded wetland, maintained by a water control structure placed at its outlet. Service jurisdiction is limited to lands surrounding the pond, and only includes a small segment of the stream at the pond's inlet. There are no other known waterways on Service lands. Therefore, we do not consider any of the waters on refuge lands to be free-flowing. For this reason, we have determined that streams or stream segments within Carlton Pond WPA do not meet the minimum requirements for designation as wild or scenic under the Wild and Scenic Rivers Act.

River or Stream Segment: Sunkhaze Stream and its Tributaries
Length: 5 miles of stream, 16 miles of tributaries
Outstandingly Remarkable Values: Other Values (hydrologic quality, botanical)
Tentative Classification: Scenic

Sunkhaze Stream bisects the refuge along a northeast to southwest orientation and flows directly into the larger Penobscot River. The Sunkhaze Meadows Unit includes 5 miles of Sunkhaze Stream and another 16 miles of tributary streams that include Buzzy, Little Buzzy, Baker, Dudley and Johnson Brooks, and Birch and Little Birch Streams (see map D.1 and table D.1). Maine Department of Environmental Protection classifies Sunkhaze Stream and its tributaries as class AA waters. The State of Maine defines Class AA waters as "waters which have outstanding natural resources and which should be preserved because of their ecological, social, scenic or recreational importance. Sunkhaze Stream is a high order, relatively undeveloped stream, and this stream and its tributaries are currently listed in the NRI.

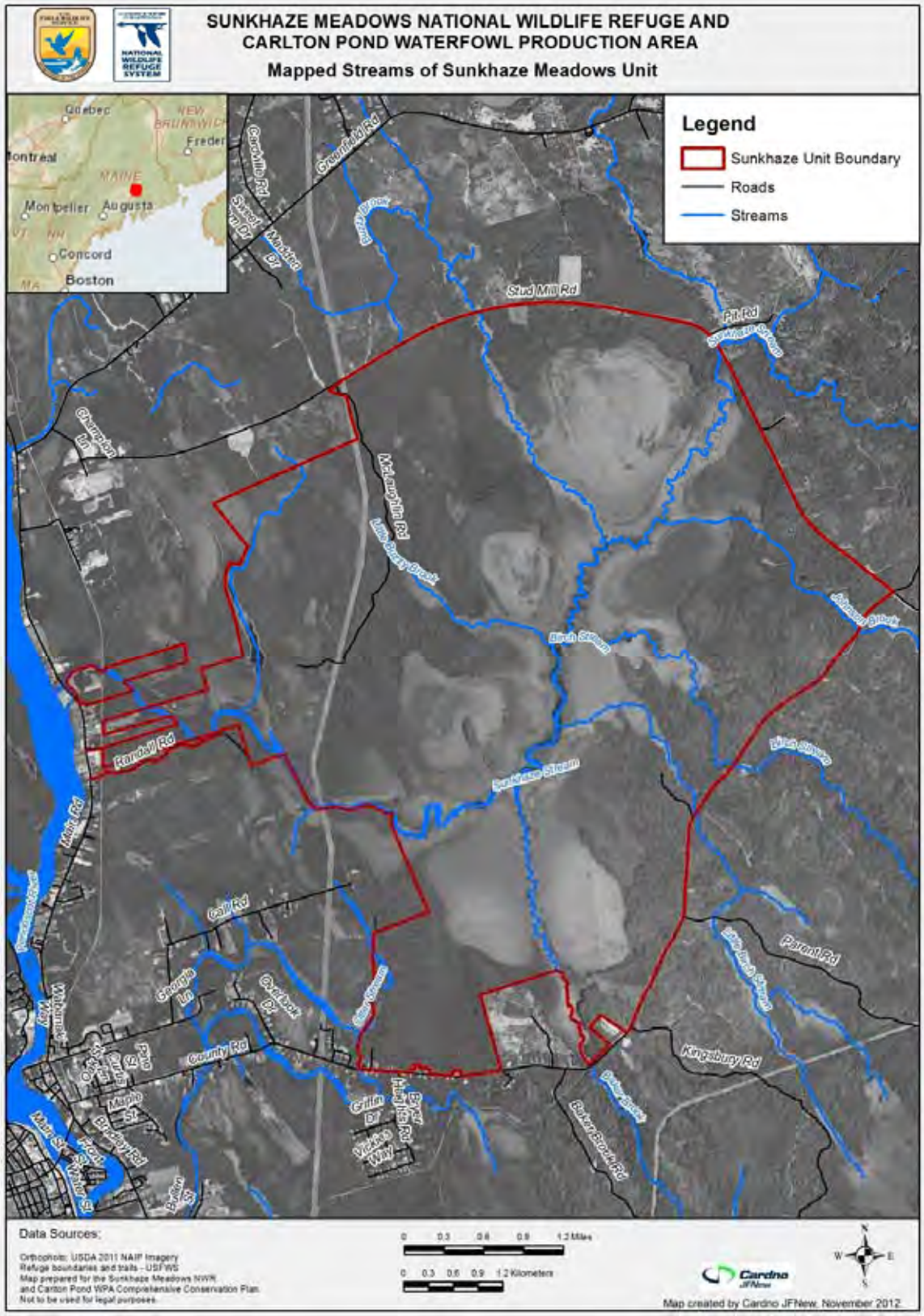
Table D.1. Lengths of stream and brook segments within the Sunkhaze Meadows Unit of the Sunkhaze Meadows National Wildlife Refuge evaluated for eligibility under the Wild and Scenic Rivers Act.

Stream or Brook	**Length (miles)**
Sunkhaze Stream	5
Little Birch Stream	1.8
Birch Stream	2.6
Baker Brook	2.9
Buzzy Brook	2.4
Little Buzzy Brook	1.9
Johnson Brook	1.9
Dudley Brook	2.4
Total	20.9

Smithwood and McKeon (1999) divide Sunkhaze Stream into three types of riverine habitat. The lower section (treed river habitat) is characterized by a deep, wide, and heavily channelized part of the stream with a hardwood canopy that shades the stream. Submerged logs are abundant and emergent vegetation is moderate. The middle section, known as “bog meadow,” is a heavily channelized river surrounded by a tall grass meadow. This habitat comprises most of the unit from below the confluence of Baker Brook to an area above the confluence of Buzzy Brook. Farther upstream the river becomes increasingly narrow and shallow. The upper section (“upper Sunkhaze”) begins near the Buzzy Brook confluence and extends upstream to the unit’s boundary at Stud Mill Road. The lower part of this habitat has a series of beaver dams that create pools and slow runs. Upstream of the confluence with Johnson Brook the canopy closes in again, dominated by alders. The grade increases just below Stud Mill Road, creating shallow fast-moving water in a series of riffles, runs, and pools (Smithwood and McKeon 1999).

Along with its six tributaries, Sunkhaze Stream supports a diversity of wetland communities. The wetland complex consists primarily of wet meadows, shrub thickets, cedar swamps, extensive red and silver maple floodplain forests and open freshwater stream habitats, along with plant communities associated with peatlands, such as shrub heaths and cedar and spruce bogs. The complex contains several large raised bogs or domes, separated by extensive areas of streamside Map D.1. Streams within the Sunkhaze Meadows Unit of the Sunkhaze Meadows National Wildlife Refuge determined to be eligible for designation under the Wild and Scenic Rivers Act.

Figure D.1. Sunkhaze Meadows Unit Mapped Streams.



freshwater meadows. Davis et al. (1983) ranked the peat bogs of the Sunkhaze Meadows Unit high quality among 31 other peatlands in Maine based on its developmental-morphological diversity, pristine character, and exemplary quality of peatland type or feature. It is the second largest peatland in the State, with peat thickness ranging from 5 to 20 feet.

The bogs and stream wetlands, adjacent uplands and associated transition zones, also provide habitat for many wildlife species. Brook trout and American eel are native to the Sunkhaze Stream system. Beaver are especially abundant along Sunkhaze Stream and its tributaries, as evidenced by their lodges, dams, caches, and scent mounds. The wood turtle, a species of special concern in Maine, has been observed in the Sunkhaze Stream system.

While the unit is bordered by roads, the interior is largely undeveloped. There are relatively few trails and fewer roads because of the prevalence of bog and other wetland habitats. This, combined with seasonal flooding, has discouraged development of infrastructure along the stream and tributary shorelines both before the refuge was established and after acquisition. Therefore, the shorelines of these streams and creeks remain difficult to access by land and are largely undeveloped.

Conclusion
Because of the unique botanical resources associated with this stream system, its free-flowing nature, and its outstanding water quality, we have determined that Sunkhaze Stream and its tributaries within the refuge boundary are eligible for designation under the Wild and Scenic Rivers Act. Because of the relatively undeveloped nature of their banks and existing road access, we have tentatively classified these waters as scenic, based on the definitions established in the act. We will complete the suitability study and submit a recommendation, if applicable, after the CCP process is completed. The suitability study will be subject to additional public review under NEPA.

Protective Management

Once a river or river segment is found eligible by an agency, the agency must evaluate any subsequent actions within its jurisdiction to ensure the actions do not affect potential wild and scenic river designation. Management activities and authorized uses must not adversely affect either the eligibility, or the tentative classification from a wild area to a scenic area or a scenic area to a recreational river area. In other words, for Sunkhaze Stream and its tributaries, we need to ensure that activities conducted under our jurisdiction do not affect the characteristics of the stream that make it eligible for designation. Under the conditions and restrictions specified in Sections 7(b), 8(b), 9(b) and 12(a) of the act, the river is protected for the duration of the study plus up to 3 years after the required report is submitted (along with the Presidents recommendation) to Congress. Should Congress not act within the 3-year time frame, the river is no longer afforded protection by the act.

Protective management for eligible river segments should provide protection in the following ways:

- **1. Free-flowing Values:** The free-flowing characteristics of the eligible river segments cannot be modified to allow stream impoundments, diversions, channelization, and/or rip-rapping to the extent the Service is authorized under law.
- **2. River-related Values:** Each segment must be managed to protect identified ORVs and, to the extent practicable, these values must be enhanced.
- **3. Classification Impacts:** Management and development of the eligible river and its corridor cannot be modified, subject to valid existing rights, to the degree that its eligibility or tentative classification would be affected.

At this time, we do not believe it is necessary to establish any additional protective measures to protect the eligibility or ORVs of these waterways. None of the alternatives presented in the draft CCP and EA include management that would impede the free-flowing nature of these systems, their ORVs, or the tentative classification. As stated previously, we do not expect the results of the review process, or designation if it occurs, to affect any of the existing public uses or proposed habitat management of Service lands or waters. If, in the future, we determine that additional protective measures are necessary that would affect existing public uses, we will notify the public at least 30 days in advance of implementing the measures. At that time, we will provide opportunities for public comment on any proposed changes.

Literature Cited

Diedrich, J. and C. Thomas. 1999. The Wild and Scenic River Study Process. Technical report prepared for the Interagency Wild and Scenic Rivers Coordinating Council. Prepared by the U.S. Forest Service Portland, Oregon and the National Park Service, Anchorage, Alaska. 54 pp. accessed November 2012 online at *http://www.gehwa.org/Wild%20&%20Scenic%20River%20Files/W&S%20study-process.pdf*

Davis, R.B., G.L. Jacobson, L.S. Widoff, and A. Zlotsky. 1983. Evaluation of Maine peatlands for their unique and exemplary qualities. A report to the Maine Department of Conservation. Institute for Quaternary Studies and Department of Botany and Plant Pathology, University of Maine, Orono, Maine.

Smithwood, D.A. and J.F. McKeon. 1999. Sunkhaze Meadows National Wildlife Refuge fisheries management plan. U.S. Fish and Wildlife Service, Laconia, New Hampshire.

Appendix E

USFWS

American black duck

Staffing Charts

Figure E.1. U.S. Fish and Wildlife Service, Maine Coastal Islands National Wildlife Refuge, Existing Staffing – Alternative A, (Petit Manan/Cross Island/Sunkhaze Meadows/Carlton Pond/Franklin Island/Pond Island/Seal Island)

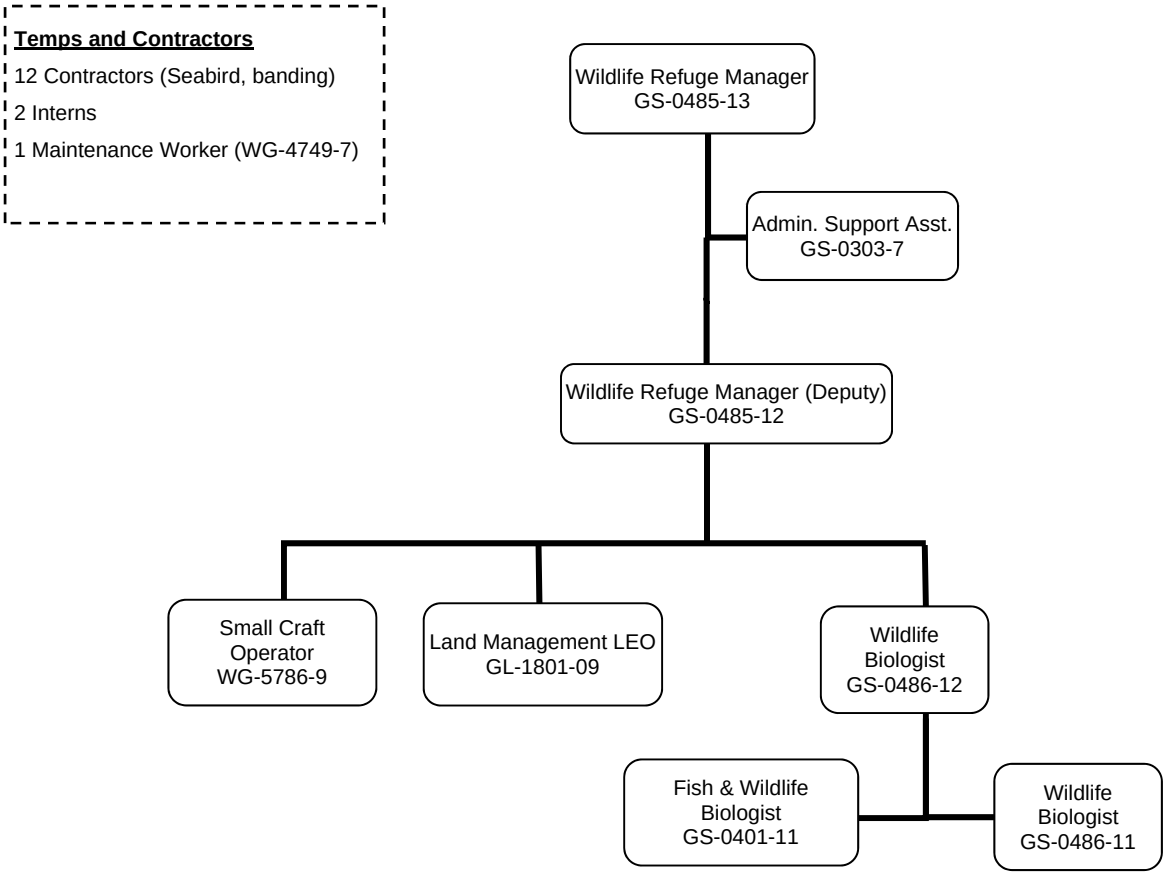


Figure E.2. U.S. Fish and Wildlife Service, Maine Coastal Islands National Wildlife Refuge, Proposed Staffing – Alternative B, (Petit Manan/Cross Island/Sunkhaze Meadows/Carlton Pond/Franklin Island/Pond Island/Seal Island)

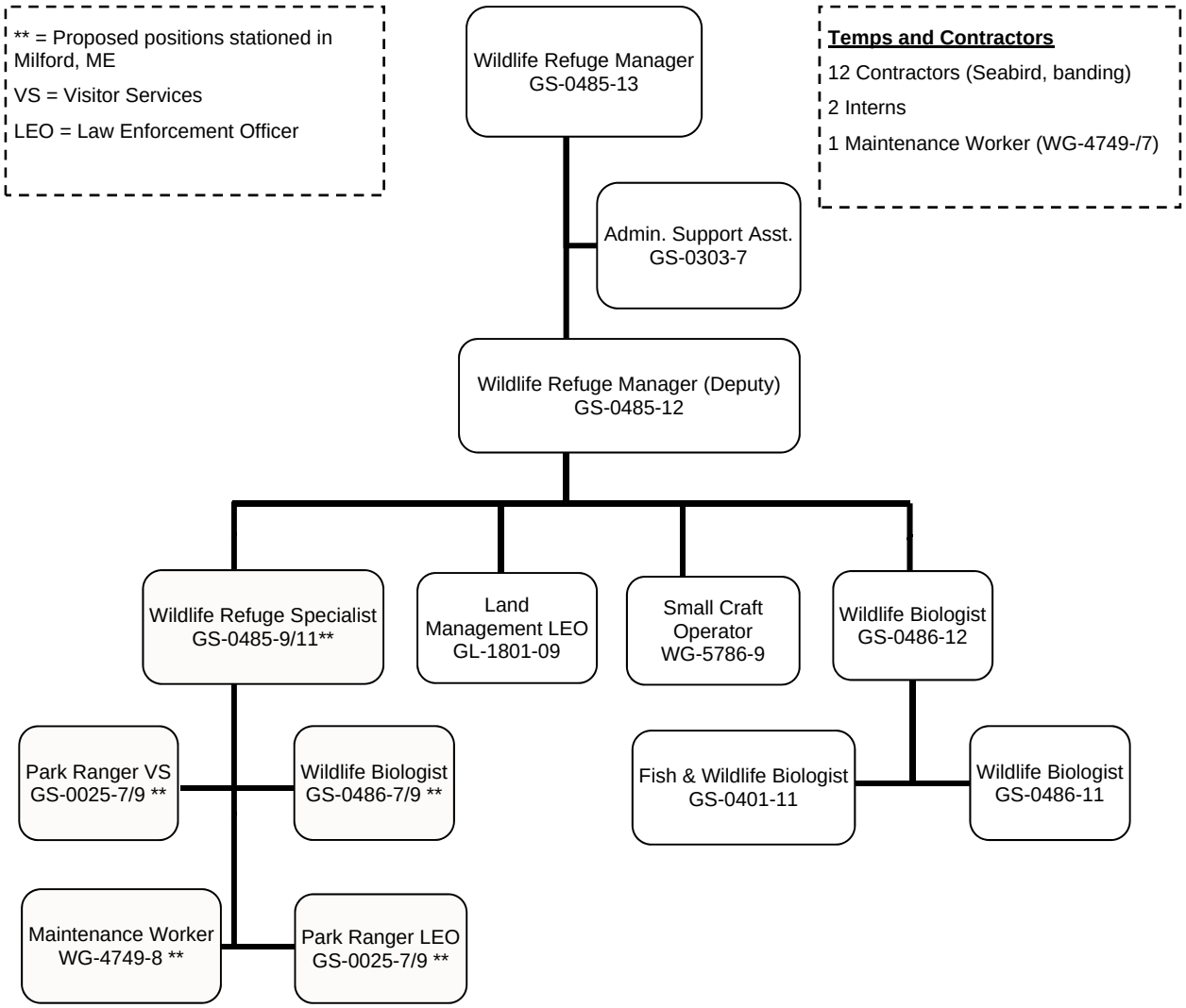
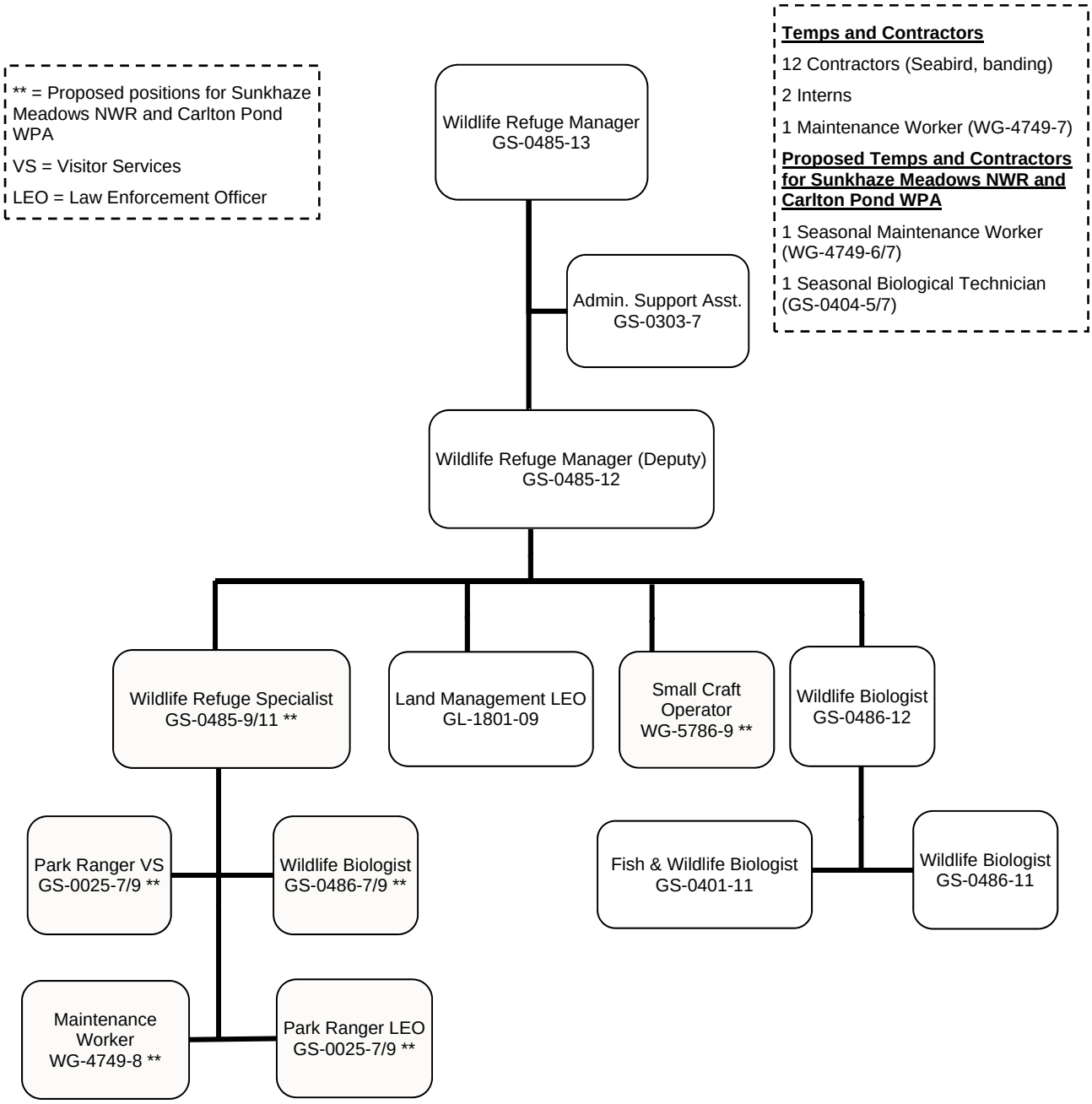


Table E.3. U.S. Fish and Wildlife Service, Maine Coastal Islands National Wildlife Refuge, Proposed Staffing – Alternative C, (Petit Manan/Cross Island/Sunkhaze Meadows/Carlton Pond/Franklin Island/Pond Island/Seal Island)



Appendix F

Mark Musselman, USFWS

Prothonotary warbler

Proposed Refuge and Staff Costs

Table F.1. Proposed dedicated staff for Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area under each alternative and estimated annual costs (in 2012 dollars).

Position Title	**Refuge Rank**	**Alternative A**	**Alternative B** (Estimated Annual Cost)	**Alternative C** (Estimated Annual Cost)
Wildlife Refuge Specialist (GS-0485-9/11)	1		$110,507	$110,507
Park Ranger – Visitor Services (GS-0025-7/9)	2		$91,334	$91,334
Wildlife Biologist (GS-0486-7/9)	3		$91,334	$91,334
Maintenance Worker (WG-4749-8)	4		$84,011	$84,011
Park Ranger – Law Enforcement (GS-0025-7/9)	5		$102,405	$102,405
Biological Science Technician (Seasonal) (GS-0404-5/7)	6			$36,772
Maintenance Worker (Seasonal) (WG-4749-5/7)	7			$40,149
TOTAL		**$0**	**$479,591**	**$556,512**

Table F.2. Proposed Projects for Sunkhaze Meadows National Wildlife Refuge and Carlton Pond Waterfowl Production Area under all of the alternatives and estimated costs (in 2012 dollars).

Project Title	Location	Cost	Frequency	Refuge Rank	Alternative		
					A	B	C
EXISTING FACILITIES							
Maintain Cabin 1	Sunkhaze Meadows Unit				X	X	X
Maintain Cabin 2	Sunkhaze Meadows Unit				X	X	X
Demolish Cabin 3	Sunkhaze Meadows Unit	$12,000	one time			X	X
Demolish Cabin 4	Sunkhaze Meadows Unit	$12,000	one time			X	X
Improve directional trail signs	Sunkhaze Meadows Unit					X	X
Replace boardwalks along Johnson Brook Trail	Sunkhaze Meadows Unit	$110,000	one time			X	X
Maintain North and South Buzzy Brook Trails	Sunkhaze Meadows Unit		annually		X		X
Maintain Carter Meadow Trail, Johnson Brook Trail, Ash Landing Trail, and Oak Point Trail	Sunkhaze Meadows Unit		annually		X	X	X
NEW FACILITIES							
Construct or acquire new refuge headquarters	at or near Sunkhaze Meadows Unit	unknown	one time, then annual maintenance			X	X
Develop new trail head from the entrance of Carter Meadow Road to the existing Carter Meadow trailhead	Sunkhaze Meadows Unit	$17,500	one time			X	X
Develop two gravel parking areas	Sunkhaze Meadows Unit	$26,950 (for both)	one time			X	X
Design and construct kiosk	Benton Unit	$10,000	one time			X	X
Develop interpretive display for grassland management	Benton Unit	$5,000	one time			X	X
Create 0.25-mile long pedestrian connector trail between the parking lot and existing snowmobile trail	Benton Unit	$8,750	one time			X	X
Create additional 3.4 miles of trails	Benton Unit	$119,000	one time				X

U..S. Fish & Wildlife Service
Sunkhaze Meadows National Wildlife Refuge and
Carlton Pond Waterfowl Production Area
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Federal Relay Service
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U.S. Fish & Wildlife Service
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For Information about National Wildlife Refuges
1 800/344 WILD

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