Chapter 2

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Harper's Meadow with loon

Alternatives Considered, Including the Service-Preferred Alternative

Introduction

This chapter presents:

- Our process for formulating alternatives;
- Actions that are common to all alternatives;
- Actions or alternatives considered but not fully developed; and,
- Descriptions of the three alternatives we analyzed in detail.

At the end of this chapter, table 2.2 compares how each of the alternatives addresses significant issues, supports major programs, and achieves refuge goals.

Formulating Alternatives

Relating Goals, Objectives, and Strategies

Refuge goals and objectives define each of the management alternatives identified below. As we described in chapter 1, developing refuge goals was one of the first steps in our planning process. Goals are intentionally broad, descriptive statements of the desired future condition for refuge resources. By design, they are less quantitative, and more prescriptive, in defining the targets of our management. They also articulate the principal elements of refuge purposes and our vision statement and provide a foundation for developing specific management objectives and strategies. Our goals are common to all the alternatives.

The next step was to consider a range of possible management objectives that would help us meet those goals. Objectives are essentially incremental steps toward achieving a goal; they also further define the management targets in measurable terms. They typically vary among the alternatives and provide the basis for determining more detailed strategies, monitoring refuge accomplishments, and evaluating our success. The Service guidance in "Writing Refuge Management Goals and Objectives: A Handbook" (USFWS 2004a) recommends that objectives possess five properties to be "SMART": (1) specific; (2) measurable; (3) achievable; (4) results-oriented; and (5) time-fixed.

A rationale accompanies each objective to explain its context and why we think it is important. We will use the objectives in the alternative selected for the final CCP in writing refuge step-down plans. We will measure our successes by how well we achieve those objectives.

We next identified strategies for each of the objectives. These are specific actions, tools, techniques, or a combination of those that we may use to achieve the objective. The list of strategies under each objective represent the potential suite of actions to be implemented, and by design, most will be further evaluated as to how, when, and where they should be implemented in refuge step-down plans.

Developing Alternatives, including the "No Action" Alternative

After identifying a wide range of possible management objectives and strategies that could achieve the goals, we began the process of crafting management alternatives. Simply put, alternatives are packages of complementary objectives and strategies designed to meet refuge purposes, the Refuge System mission, and goals, while responding to the issues and opportunities identified during the planning process.

To this end, we grouped objectives that seemed to fit together in what we loosely called "alternative themes." For example, we considered such themes as "current management," "passive management," "focal species management," and "natural processes management." These were firmed up into four, and then later three,

management alternatives after further evaluating how respective objectives would interact, their compatibility with refuge purposes, and the reality of accomplishing the objectives in a reasonable time frame.

We fully analyze in this draft CCP/EIS three alternatives which characterize different ways of managing the refuge over the next 15 years. We believe they represent a reasonable range of alternative proposals for achieving the refuge purpose, vision and goals, and addressing the issues described in chapter 1. Unless otherwise noted, all actions would be implemented by refuge staff.

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. We suggest you first read Chapter 3, "Description of the 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's goals and objectives handbook because we are describing current management decisions and activities that were established prior to this guidance. Rather, our descriptions of these activities were derived from a variety of formal and informal management decisions and planning documents. As such, alternative A objectives are fewer and more subjective in nature than alternatives B and C.

Alternative B, the Service-preferred alternative, combines the actions we believe would most effectively achieve refuge purposes, vision and goals, and respond to public issues. It emphasizes management of specific refuge habitats to support focal species whose habitat needs benefit other species of conservation concern in the Northern Forest. In particular, we emphasize habitat for priority bird species of conservation concern identified for BCR 14.

Alternative C emphasizes management to restore where practicable, the distribution of natural communities in the Upper Androscoggin River watershed that would have resulted from natural processes without the influence or intervention of human settlement and management. While this alternative does not propose breaching the Errol Dam that expanded Umbagog Lake, it proposes actions to modify the flow and timing of water to mimic the annual natural historic high and low water events, within the requirement of the existing FERC license. In the uplands, it proposes actions to restore the structure and function of native vegetation which resulted from natural historic ice and wind storm events.

We have developed a habitat map for each alternative, presented with each respective alternative's discussion later in this chapter, to help readers visualize how the refuge vegetation would look over the long-term after managing under each respective scenario. Using Geographical Information Systems (GIS) mapping tools and data sets, our habitat maps are a graphic representation of the potential vegetation that may result under each respective alternative at a coarse scale, and over an approximate 100-year time frame. While we describe in detail possible vegetation management actions within the 15-year CCP planning horizon for alternatives B and C, most of the distinct habitat changes would not be observable at this scale for at least 50 years. The maps are meant to compare the potential distribution of those habitat changes, but are not meant to identify exact locations for implementing a particular strategy on the ground. It will be up to our refuge staff to decide during the implementation phase what specific strategy applies to a particular site, at what level or timing it should apply, and exactly

where it applies on a given site. These actions will be detailed in the annual HMP (see "Refuge Step-Down Plans" below) and annual work plans. Appendix K provides additional, more specific details on our forest management proposals. It also includes a map of our habitat management units on current refuge lands, within which we propose that more active management would occur over the next 15 years (see map K-1).

Actions Common to All of the Alternatives

All of the alternatives share some common actions. Some are required by law or policy, or represent NEPA decisions that recently have gone through public review, and agency review and approval. Or, they may be administrative actions that do not necessarily require public review, but we want to highlight them in this public document. They may also be actions we believe are critical to achieving the refuge's purpose, vision, and goals.

Developing Refuge Step-down Plans

Service planning policy identifies 25 step-down plans that may be applicable on any given refuge. We have identified the six plans below as the most relevant to this planning process, and we have prioritized them. Sections of the refuge HMP which require public review are presented within this document and will be incorporated into the final version of the HMP immediately upon CCP approval. We will also develop an annual HMP and HSIMP as the highest priority step-down plans, regardless of alternative selected for implementation. These are described in more detail below. They will be modified and updated as new information is obtained so we can continue to keep them relevant. Completion of these plans supports all seven refuge goals.

All of the alternatives schedule the completion of these step-down management plans as shown.

- A HMP, immediately following CCP approval (see discussion immediately below, and discussion on NEPA requirements on page 2-16)
- An annual HMP, within 1 year of CCP approval (see discussion below)
- A HSIMP, within 2 years of CCP approval (see discussion below)
- A FMP will accompany the final CCP (see appendix I)
- A LPP will accompany the final CCP (see appendix A)
- A Hunt Plan (revised April 2007), within 1 year of CCP approval
- A Fishing Plan, within 2 years of CCP approval
- A Visitor Services Plan, within 3 years of CCP approval, and assuming a Visitor Services Professional (VSP) is hired; would incorporate hunt and fishing plans noted above
- A Law Enforcement Plan, within 3 years of CCP approval
- Facilities and Sign Plan, within 3 years of CCP approval
- Furbearer Management Plan within 3 years of CCP approval

Habitat Management Plan
A HMP for the refuge is the requisite first step to achieving the objectives of goals 1–3, regardless of the alternative selected for implementation. For example, the HMP will incorporate the selected alternative's habitat objectives developed

herein, and will also identify "what, which, how, and when" actions and strategies will be implemented over the 15 year time frame to achieve those objectives. Specifically, the HMP will define management areas, treatment units, identify 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 list of strategies under each objective identify how we intend to manage habitats on the refuge. Both the CCP and HMP are based on current resource information, published research, and our own field experiences. Our methods, timing, and techniques will be updated as new, credible information becomes available. To facilitate our management, we will regularly maintain our GIS database, documenting any major vegetation changes on at least a 5 year basis. As appropriate, actions listed below in "Actions Common to All Alternatives" will be incorporated into the HMP.

Annual Habitat Management Plan and Habitat and Species Inventory and Monitoring Plan

The annual HMP and HSIMP for the refuge are also priorities for completion upon CCP approval. Regardless of the alternative chosen, these plans are also vital for implementing habitat management actions and measuring our success in meeting the objectives. The annual HMP is generated each year from the HMP, and will outline specific management activities to occur in that year. The HSIMP will outline the methodology to assess whether our original assumptions and proposed management actions are, in fact, supporting our habitat and species objectives. Inventory and monitoring needs will be prioritized in the HSIMP. 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.

Coordinating Umbagog Lake Water Level Management

Under all alternatives, we will continue to work cooperatively with the FERC licensee of the Errol Project. Specifically, under Article 27 of the current license, we would continue to develop a yearly water level management plan with the licensee and other regulatory agencies "to benefit nesting wildlife." While we and others have expressed concerns about the impacts from fluctuating water levels, these concerns have not been evaluated and researched in sufficient detail for us to modify the current water level plan. As such, we will continue to promote stable water levels during the nesting season to the extent possible. We will also work to complete a Memorandum of Understanding (MOU) with FPLE, the current holder of the FERC license for the Errol Project, to coordinate activities within the FERC boundary. In addition, although not binding under the current license, we will continue to recommend to FPLE that they voluntarily manage water levels at other critical times of the year (e.g. during fall migration) to benefit wildlife.

Under alternatives B and C, objective 1.5, we have identified several future studies, and inventory and monitoring projects that will assist in evaluating the impacts from water level fluctuations. Implementing this activity supports refuge goal 1 relating to the conservation of open water and wetlands habitats.

Control of Invasive Plant Species

The Refuge System has identified management to control the establishment and spread of invasive plants as a national priority. Fortunately, on this refuge, the threat is currently low. However, our objective is to ensure no new plant species become established, and we will mange to control the spread of what does exist. To the extent possible, we will physically remove invasive species where they are encountered. Although we have not previously had the need, we propose to use approved glyphosate-based herbicides when determined by the refuge manager to be necessary to control invasive plants, after regional office review and approval. Of particular concern on the refuge are purple loosestrife, *Phragmites,* Eurasian milfoil, and Japanese knotweed.

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Aerial view of a portion of the Floating Island National Natural Landmark

In conjunction with the HMP and HSIMP, we will develop a list of species of greatest concern on the refuge, identify priority areas with which to be vigilant, and establish monitoring and treatment strategies. Refer to the National Wildlife Refuge System Invasive Species Management Strategy released in May 2004 (USFWS 2004b) for additional tools, processes, and strategies. The 2004 report is complimented by a technical report issued in May 2005 by USGS, titled: The Invasive Species Survey: A Report on the Invasion of the National Wildlife Refuge System (USGS 2005). These reports together give both a status review and a management strategy for combating invasive species. In addition, we will stay abreast of Service policy revisions currently being reworked to facilitate implementation. Other strategies include:

- Survey the Floating Island National Natural Landmark (FINNL) and other unique or rare plant communities as a priority to ensure invasive plants do not threaten the integrity of these sites and implement treatments as warranted (see additional discussion on FINNL below);
- Institute proper care of all refuge equipment to avoid introduction or transport of invasive plants;
- Continue to work with state agencies to prevent introduction of invasive species to all water bodies on the refuge; increase enforcement to check boats and equipment to protect against invasive plant transport;
- Implement outreach and education programs, and actively support state initiatives on this topic; and,
- Develop special regulations on the refuge as warranted to control spread of invasive species.

Implementing this program supports refuge goals 1-3 relating to the conservation of open water, wetlands, floodplain and lakeshore, and upland forest habitats.

Implementing and Prioritizing a Biological Monitoring and Inventory Program

Establishing a foundation of information, or a baseline, from which to make management decisions is critical to achieving our goals. There is much we would like to know about the refuge's resources, including how they function or move across the landscape, and what threatens them. Unfortunately, there is not enough time or funding to accomplish all we would like to know. There are several studies we initiated or plan to initiate during 2006-2007 including:

- Visitor use and impact;
- Wildlife disturbance study;
- An ecological systems analysis to identify the ecological processes that historically and currently influence the lake, determine lake bathymetry, identify wetlands functions and measures of integrity, and evaluate water quality; and,
- Baseline contaminants assessment.

Other top priority activities we have identified as funding allows include:

- In conjunction with development of HSIMP, identify what inventory methods should be implemented to confirm the status and critical components necessary to sustain focal species and habitats identified in objective statements. Prioritize list and begin implementing by re-directing refuge biologist's time to priority inventory and monitoring activities;

- Continue to coordinate with state agencies in the monitoring of bald eagle, osprey, and loon nests, and to evaluate the effectiveness of our protection measures. Objectives 1.6 and 2.3 identify the protection measures we currently implement, or propose to implement, to protect these birds from human disturbance during the nesting season under each alternative; pursue expanding this cooperative monitoring effort to forest dependent raptors suspected to be in decline;

- Within 3 years of CCP approval, in cooperation with the Lynx Recovery Team, determine whether a monitoring or inventory program on the refuge is warranted for lynx. Implement a program if there is consensus on its value. If survey results are favorable, and recovery experts agree the refuge can make an important contribution to lynx recovery, we will amend the HMP to include measures to sustain and enhance habitat for lynx; and,

- See discussion below on "deer wintering areas," "vernal pools" and the "Floating Island National Natural Landmark."

Implementing this program supports refuge goals 1-3 relating to the conservation of open water, wetlands, floodplain and lakeshore, and upland forest habitats.

Protecting Vernal Pools and other Unique or Rare Communities

Vernal pools and other unique or rare natural communities are important to the health, integrity, and biodiversity of the Upper Androscoggin watershed. Despite the small size, patchiness, and ephemeral nature of some of these habitats, their value is disproportionately significant. All alternatives recognize their importance and propose to promote their conservation.

Our objective is to conserve and maintain all natural vernal pools, including those pools imbedded in wetland or riparian habitats, on existing refuge lands and within the respective refuge expansion areas. Also, we will conserve and protect cliffs, talus slopes, and other unique, significant, or rare upland habitat types identified by Maine Natural Areas Program (MNAP) and NHNHI on these same lands.

Strategies:

- Within 5 years of CCP completion, complete inventory for vernal pools and map in GIS; develop as a RONS project. At a minimum, prior to any forest management activities, survey stands for vernal pools and insure best management practices are followed;

- Establish criteria for ranking vernal pools as to their conservation concern and need for management based on size, location, threats, productivity, seasonality, species diversity, and other parameters;

- Within 7 years of CCP completion, develop and implement management standards and guidelines to conserve vernal pool habitat; determine which pools should be protected by a no-disturbance buffer vs. those that should be managed and restored;

- Evaluate effectiveness of management and protection zones;

- Promote vernal pool conservation in refuge outreach programs;
- Within 7 years of CCP approval, cooperate with NHNHI and MNAP to inventory and map the other rare and unique types in a GIS database; develop standards and guidelines for the protection and management of these types

Implementing this program supports refuge goals 1-3 relating to the conservation of open water, wetlands, floodplain and lakeshore, and upland forest habitats.

Expanding and Protecting the Floating Island National Natural Landmark

In chapter 3 we describe the establishment of the FINNL in 1972. It was chosen by the National Park Service (NPS) as an example of an exemplary native bog community. It is currently 860 acres and lies entirely within the refuge boundary.

In cooperation with the NPS, all alternatives would expand the boundary of the FINNL to one that is more ecologically-based using the 2002-2003 vegetation survey results (see map 2-1). This new boundary encompasses 2,181 acres. Within 5-10 years of CCP approval, we will conduct all administrative procedures with NPS to expand the boundary and convene a workshop with wetlands ecologists to determine what information should be collected and what monitoring should occur to document any potential loss or degradation of the area. We will also establish a baseline from which to compare subsequent information.

Implementing this program supports refuge goal 1 relating to the conservation of open water and wetlands habitats.

Removing Unnecessary Structures and Site Restoration

All alternatives include restoring to natural conditions, as soon as practicable, developed sites that are no longer needed for refuge administration or programs.

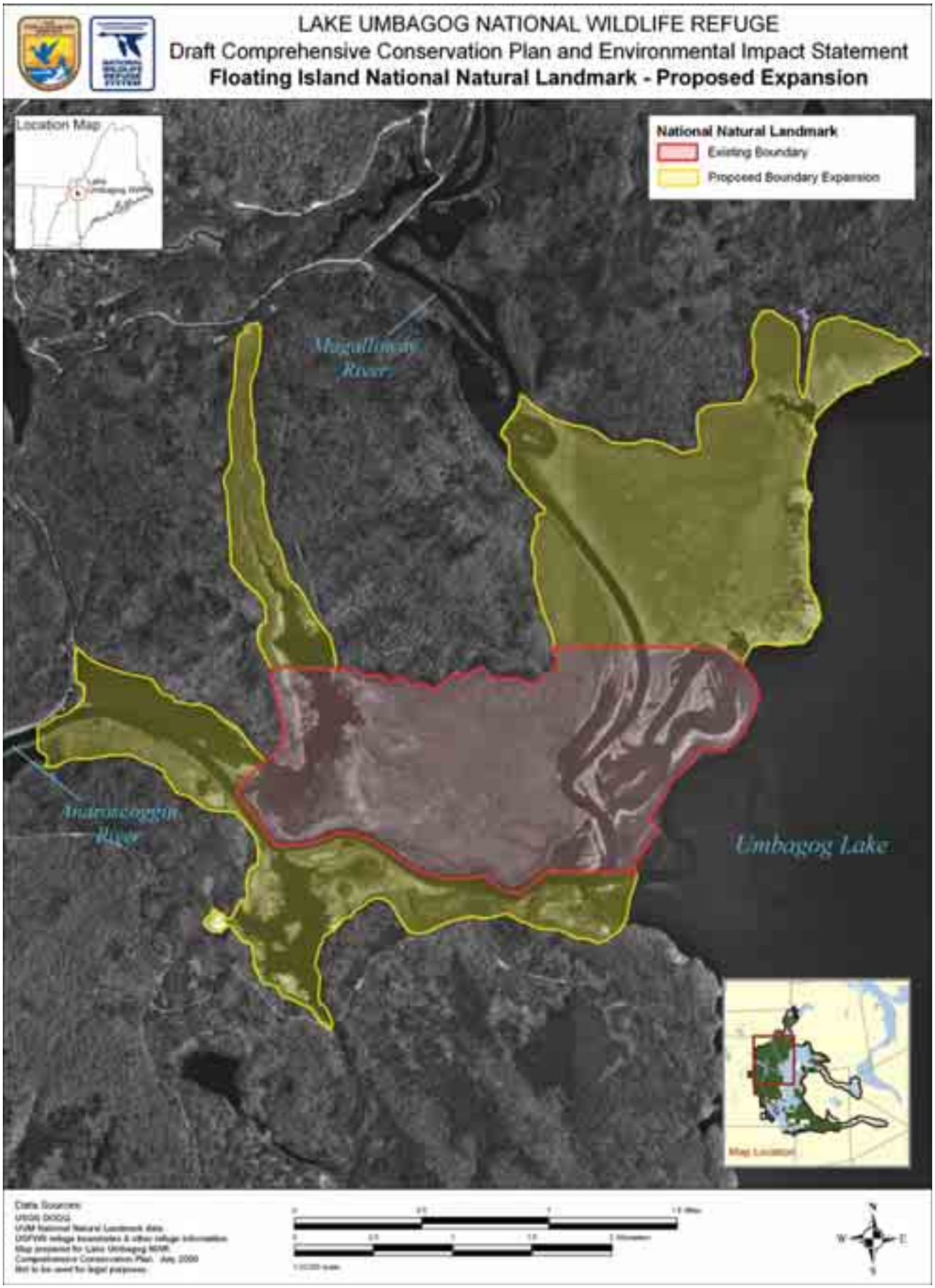
Strategies:

- Within 3 years of acquisition, remove dwellings, such as cabins or other developed sites or structures, if determined they are surplus to refuge needs, and assuming funding is available. Re-grade sites to natural topography and hydrology and re-vegetate to establish desirable conditions.
- Within 3 years of CCP approval, complete demolition of the 12 camps already acquired.
- Within 5 years of CCP completion, inventory and assess all access roads within the refuge, and on any newly acquired lands, and implement procedures to retire and restore unnecessary forest interior and secondary roads to promote watershed and resource protection. All off-road (ORV) and all–terrain vehicles (ATV) trails, and all unauthorized snowmobile trails, will be eliminated. However, in general, on lands identified in the proposed refuge expansion, all existing main access roads would remain open to provide motorized and non-motorized access for approved activities. Other designated motorized access may be developed in the expansion area once a minimum manageable unit is acquired.

Implementing this program supports refuge goals 2-3 relating to the conservation of floodplain, lakeshore and upland forest habitats.

Maintaining Partnerships

All of the alternatives would maintain the existing partnerships identified in chapter 3 and under Goal 6, objective 6.1, while also seeking new ones. These relationships are vital to our success in managing all aspects of the refuge, from conserving land, to managing habitats and protecting species, to outreach and education, and providing wildlife-dependent recreation. The NHFG and


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Floating Island National Natural Landmark - Proposed Expansion
Location Map
National Natural Landmark
Existing Boundary
Proposed Boundary Expansion
Magalloway River
Androscoggin River
Umbagog Lake
Map Location

the MDIFW have been particularly important and valued partners. We will pursue new partnerships in areas of mutual interest that benefit refuge goals and objectives. We highlight two partnership efforts below. Implementing this program supports all refuge goals, with particular emphasis on goal 6 relating to conserving and managing wildlife resources through partnerships.

Land Conservation
One of our biggest partnership programs is focused on land conservation in the region. All alternatives include our continued participation in those partnerships with the goal to permanently protect and sustain Federal trust resources and other unique natural resource values in the Umbabog area and the Northern Forest ecosystem. An important component of this goal is an objective to improve connectivity between existing conservation tracts and preserve working forest and public access. Conservation partnerships in the region have evolved into a dynamic, landscape-level, multi-partner effort. The list of partners is extensive and includes the Service, other Federal agencies, state agencies, private conservation organizations, local communities, private landowners, and private businesses. Appendix A, the LPP, includes a detailed description of some of the important accomplishments, as well as some current land conservation projects.

While the LPP focuses on land acquisition as a conservation strategy, we are also working with our partners to cooperatively manage important natural resources on other ownerships. One example is in Maine. In 2005, we assessed a U.S. Department of the Navy Training Facility in Redington, Maine, a unit of Brunswick Naval Air Station, which was included on the 2005 Base Realignment and Closure list. We determined the property had high Federal trust resource value and expressed an interest in acquiring it if it is ever officially excessed. In the meantime, we are pursuing a cooperative management agreement with the Navy to manage its natural resource values.

Creating an Umbagog Lake "Working Group"
All alternatives propose that within 3 years of CCP completion, an Umbagog Lake Working Group will be created. Members will include representatives from those state and federal agencies with management authority of the lake and its natural resources and recreational opportunities. The mission of the group will be to voluntarily coordinate, facilitate, and/or streamline management as a partnership to reduce resource threats and resolve user conflicts on the lake and associated rivers. This partnership would not function as a regulatory or enforcement entity, although members may propose changes in existing regulations to their respective regulatory authorities to facilitate a management goal. Some of the priority projects we propose the working group consider are listed below; additional strategies specific to alternatives B and C are included in objective 6.2:

- Work with states to eliminate the use of lead fishing tackle; in conjunction, evaluate the potential for wildlife to ingest lead (bio-availability) from this and other sources in the surrounding lake and rivers;

- Work with State of New Hampshire to evaluate no-wake exemption on Magalloway and Androscoggin rivers which allows high speed boat operation within 150 feet of shoreline

- Cooperatively evaluate area closures to determine if changes to current protection measures are warranted;

- In coordination with states of Maine and New Hampshire agencies, conduct outreach at known user conflict sites such as the Rapid River, and boat launch sites;

- Develop boater ethics programs for the lake and rivers and develop outreach materials for distribution at boat launch sites; and,

- Identify sources of point and non-point sediment and nutrient loading (e.g. septic systems, erosion, forest and other land use practices, etc) impacting refuge wetlands, Umbagog Lake, and associated lakes and rivers, and address these sources where possible.

Permitting Special Uses, Including Research, Economic Uses, and Camp Leases

All of the alternatives would require the refuge manager to evaluate activities that require a special use permit for their appropriateness and compatibility on a case-by-case basis. All research, commercial or economic uses, and camp leases require special use permits. Implementing this program supports refuge goals 1-3 relating the conservation of open water, wetlands, floodplain, lakeshore and upland forest habitats, and goal 6, relating to conserving and managing wildlife resources through partnerships.

Research

Research on species of concern and their habitats will continue as a priority. Generally, we will approve permits that provide a direct benefit to the refuge, or for research that will strengthen our decisions on managing natural resources on the refuge. The refuge manager also may consider requests that do not relate directly to refuge objectives, but to the protection or enhancement of native species and biological diversity in the region and support the goals of the proposed Umbagog Lake Working Group, or recognized ecoregional conservation team, such as the Atlantic Coast or Eastern Brook Trout joint ventures.

All researchers will be required to submit detailed research proposals following the guidelines established by Service policy and Refuge staff. Special use permits will also identify the schedules for progress reports, the criteria for determining when a project should cease, and the requirements for publication or other interim and final reports. All publications will acknowledge the Service and the role of Service staff as key partners in funding and/or operations. We will ask our refuge biologists, other divisions of the Service, USGS, select universities or recognized experts, and states of New Hampshire and Maine agencies to peer review and comment on research proposals and draft publications, and will share research results internally, with these reviewers, and other conservation agencies and organizations. To the extent practicable, and given the publication type, all research deliverables will conform to Service graphic standards.

Some projects, such as depredation and banding studies, require additional Service permits. The refuge manager will not approve those projects until all required permits are received and the consultation requirements under the ESA have been met.

Working in partnership to develop goals and objectives

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Commercial and Economic Uses
All commercial and economic uses will adhere to 50 CFR, Subpart A, §29.1 and Service policy which allow these activities if they are necessary to achieve the Refuge System mission, or refuge purposes and goals. Allowing these activities also requires the Service to determine appropriateness and prepare a compatibility determination and an annual special use permit outlining terms, conditions, fees, and any other stipulations to ensure compatibility.

Cabin (Camp) Leases
No modifications are proposed for the 29 cabin leases that currently exist under special use permit. These permits are renewed every year, assuming the terms of the permit are met, and until the 50 year lease is up. In addition, there are 4 properties under life-use agreements within the refuge boundary which are observed as private landholdings until the end of their life use.

The cabin leases include certain conditions, such as (1) the camps must be maintained in a manner compatible with the purposes of the refuge and produce the least amount of environmental disturbance; and, (2) no new permits will be issued for construction of new camps on the properties. Most of these structures were built as summer fishing camps or seasonal cottages, but some have become year-round cottages. All the camp leases expire in 50 years from date of acquisition. We are not proposing any changes to lease agreements within the context of this CCP.

Distributing Refuge Revenue Sharing Payments

As we describe in chapter 3, we pay the following localities annual refuge revenue sharing payments based on the acreage and the appraised value of refuge lands in their jurisdiction: Errol, Cambridge and Wentworth Location in New Hampshire; and, Upton and Magalloway in Maine. These annual payments are calculated by formula determined by, and with funds appropriated by, Congress. All of the alternatives will continue those payments in accordance with the law, commensurate with changes in the appraised market value of refuge lands, or new appropriation levels dictated by Congress. Additional towns may be added with future acquisitions.

Conducting a Wilderness Review

As we described in chapter 1, Refuge System planning policy requires that we conduct a wilderness review during the CCP process. The first step is to inventory all refuge lands and waters in Service fee simple ownership. Our inventory of this refuge determined that no areas meet the eligibility criteria for a wilderness study area as defined by the Wilderness Act. Therefore, we did not further analyze the refuge's suitability for wilderness designation. The results of the wilderness inventory are included in appendix D. The refuge will undergo another wilderness review in 15 years as part of the next planning process.

Conducting a Wild and Scenic Rivers Review

Service planning policy also requires that we conduct a wild and scenic rivers review during the CCP process. We inventoried the river and river segments which occur within the refuge acquisition boundary area and determined that five river segments met the criteria for wild and scenic river eligibility. These river segments and their immediate environments were determined to be free-flowing and possess at least one Outstandingly Remarkable Value. However, we are not pursuing further study to determine their suitability, or making a recommendation on these river segments at this time because we believe the entire river lengths should be studied (not just those on refuge lands) with full participation and involvement of our federal, state, local, and nongovernmental partners. The results of our Wild and Scenic River inventory are included in appendix E. All alternatives would provide protection for free-flowing river values, and other river values, pending the completion of future comprehensive inter-jurisdictional eligibility studies.

Fire Management

None of our alternatives propose to utilize management-prescribed fire as a habitat management tool within the 15-year life of this CCP. While the chance of natural ignition is low, should a wildland fire occur, all alternatives also propose to rapidly and aggressively suppress it in areas where property is likely to be threatened according to the guidance in appendix I, "Fire Management Plan." Our suppression objective is to avoid property damage, minimize human health or safety concerns, and reduce the likelihood of resource damage. Fire is not a prevalent natural ecosystem process in the Northern Forest. It has been suggested by researchers that stand-replacement fire intervals are at 800+ year intervals in most regional forest types (Lorimer 1977).

Protecting Cultural Resources

As a Federal land management agency, we are entrusted with the responsibility to locate and protect all historic resources, specifically archeological sites and historic structures eligible for, or listed in, the National Register of Historic Places. This applies not only to refuge lands, but also on lands affected by refuge activities, and includes any museum properties. As described in Chapter 3, "Description of the Affected Environment," consultation with the Maine and New Hampshire SHPOs indicates there are five recorded archeological sites within the refuge area. Considering the topography of the area and proximity to water courses, it is likely that additional prehistoric or historic sites may be located in the future. Archeological remains in the form of prehistoric camps sites or villages would most likely be located along streams and lakes where early inhabitants would have ample water, shelter, and good fishing and hunting opportunities.

Under all alternatives, we will conduct an evaluation on the potential to impact archeological and historical resources as required, and will consult with respective SHPOs. We will be especially thorough in areas along the lake and streams where there is a higher probability of locating a site. These activities will ensure we comply with section 106 of the National Historic Preservation Act, regardless of the alternative. That compliance may require any or all of the following: a State Historic Preservation Records survey, literature survey, or field survey.

Refuge Staffing and Administration

Staffing and operations and maintenance funds over the last 5 years are presented in chapter 3. Below we describe activities related to staffing and administration that are shared among the alternatives; some are new, others are on-going. Implementing these activities supports all seven refuge goals.

Permanent Staffing and Operational Budgets
Under all alternatives, our objective is to sustain annual funding and staffing levels that allow us to achieve our refuge purposes, as interpreted by the goals, objectives, and strategies. Many of our most visible projects since refuge establishment, including land acquisition, were achieved through special project or "earmarked" funds that typically have a 1- to 2-year duration. While these funds are very important to us, they are limited in their flexibility since they typically can not be used for any other priority project that may arise.

In response to Refuge System operational funding declines nationwide, our region plans to initiate a new base budget approach in FY 2007. The goal is to have a maximum of 75% of a refuge station's budget cover salaries and fixed costs, while the remaining 25% or more will be operations dollars. The intent of this strategy is to improve the refuge manager's capability to do the highest priority project work and not have the vast majority of a refuge's budget tied up in inflexible, fixed costs. Unfortunately, in a stable or declining budget environment, this may also have implications to the level of permanent staffing.

Appendix F lists our RONS and SAMMS construction and maintenance projects currently listed in those databases, and indicate the regional and refuge ranking. We also included new projects not yet in the databases, but proposed under alternative B. Once approved, if funding is not available, we will continue to seek alternate means of accomplishing our projects; for example, through our volunteer program, challenge cost share grants, or other partnership grants, and internships. The SAMMS projects include a list of backlogged maintenance needs.

Under all alternatives, and within the guidelines of the new base budget approach, we would seek to fill our currently approved, but vacant positions which we believe are needed to accomplish our highest priority projects. Alternatives B and C also propose additional staff to provide depth in our biological and visitor services programs. We identify our recommended priority order for new staffing in the appendix F RONS tables. The alternatives also seek an increase in our maintenance staff since they provide invaluable support to all program areas. Appendix H identifies the staffing requests under each alternative.

New Refuge Headquarters and Visitor Contact Facility
All alternatives seek a new location for the main administrative and program headquarters office. In conjunction with our state partners, Service Visitor Service's Specialists, and the core planning team, we identified a list of site selection criteria. Four prospective sites on current refuge lands met most, if not all, of those criteria. We hired Oak Point Associates to evaluate the feasibility and economics of constructing a facility at those four prospective sites, as well as compare them to upgrading our current headquarters office on Route 16 in Errol. Their January 21, 2005 final report can be reviewed at refuge headquarters.

In summary, some of the site-selection criteria include a location: on existing refuge lands, have ready access to the lake for both staff and visitors; on a site already developed or disturbed; on a site immersed in a natural setting with a diversity of habitats to facilitate an interpretive trail, visitor programs, and outreach on refuge purposes, management, and the refuge's role in wildlife resource conservation in the Northern Forest. The four new sites were all located at the southern end of the lake and referred to as: the Potter Farm site, Thurston Cove site (option A and B), and the State Border site.

Our evaluation of the Oak Point Associates report, together with discussions and a concurrence by our state partners and local Errol officials, resulted in a consensus to propose the new facility be located at the Potter Farm site. While the Potter Farm site is common to all alternatives, the size of the facility differs depending on the alternative. Alternatives A and B propose a small office facility, as defined by the new Service facility standards, while alternative C proposes a medium office facility. Under all alternatives, the existing headquarters building would be maintained as a research or auxiliary field office. In addition, all alternatives would remove the adjacent small cabin at the current headquarters site.

Our Director, via Director's Order 144, and our regional leadership team have identified facility energy and resource conservation as a priority. As such, any new buildings or building upgrades will incorporate ecologically sound and environmentally beneficial technologies, tools, materials, and practices, including building design and construction, water and energy consumption, wastewater management, and solid and hazardous waste management.

Youth Conservation Corps
All alternatives would maintain the annual youth conservation corps (YCC) program which has generally consisted of a crew of four to five persons (15-18 years old), and a crew leader. This has been a very popular program in the local

community because youth employment opportunities are limited in this rural area. The crew accomplishes many important tasks in support of our biological and visitor services programs. If enough funding can be secured, we will expand this program to support two crews.

Facility and Fleet Maintenance
All of the alternatives include the periodic maintenance and renovation of existing facilities to ensure the safety and accessibility for staff and visitors. Our current facilities are described in chapter 3. They include administrative facilities such as refuge quarters, refuge office, and the maintenance shop off Mountain Pond road. Visitor facilities to be maintained under all alternatives include: the 1/3 mile Magalloway River trail and new ¼ mile extension, sign, and viewing platform; and, 2 roofed, wooden information kiosks. A Magalloway River canoe trail and launch site project will be implemented in 2006 and will also require periodic maintenance. Any new facilities recommended in the final CCP, once constructed, will be placed on the maintenance schedule.

Similar to our discussion under " *New Refuge Headquarters and Visitor Contact Facility,"* all facilities and fleet maintenance and upgrades would incorporate ecologically beneficial technologies, tools, materials, and practices.

Appropriateness and Compatibility Determinations
Chapter 1 describes the requirements for appropriateness and compatibility determinations. Appendix C includes draft appropriateness and compatibility determinations to support the activities in alternative B, the Service-preferred alternative. Our final CCP will include the approved compatibility determinations for the alternative selected. We will only allow activities determined compatible to meet or facilitate refuge purposes, goals, and objectives.

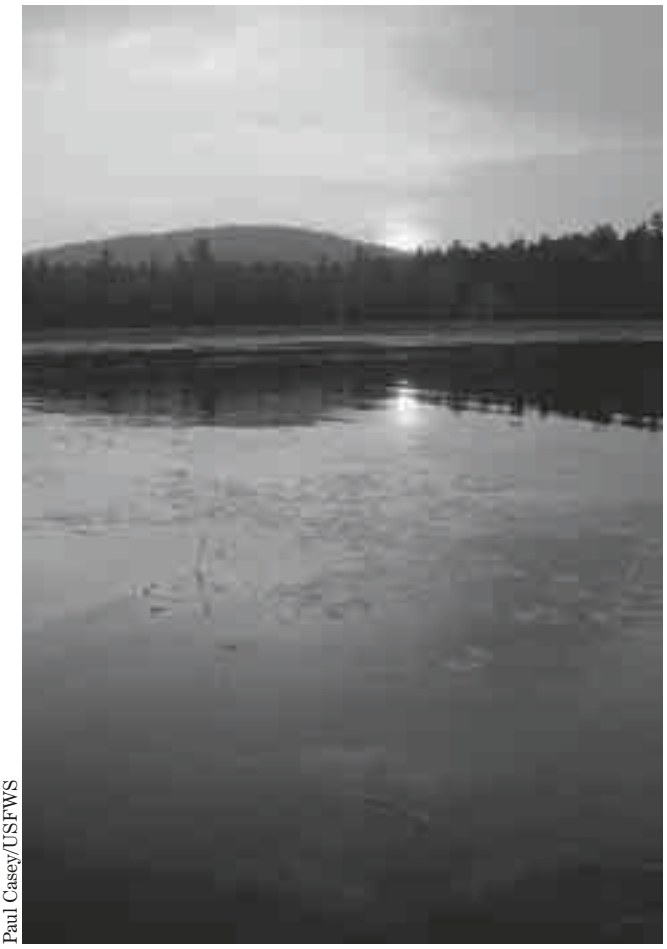
The following are stipulations to incorporate into existing or future compatibility determinations:

- Access for non wildlife-dependent activities on the refuge will occur only on certain designated trails (e.g. snowmobiling).

- Visitor motorized vehicle access on refuge roads is limited to street-registered passenger vehicles up to one-ton hauling capacity in designated areas; no ORV or ATV use will be allowed.

- When the Service acquires land in the proposed expansion area in full, fee-simple ownership, we would allow public access and compatible public recreation, and other refuge uses, consistent with what we currently allow, or propose to allow, on the existing refuge lands. When a conservation easement, or a partial interest, is purchased, the Service's objective is to obtain all rights determined necessary to insure protection of Federal trust resources on that parcel. Typically, at a minimum, the purchase would include development rights. However, we may also seek to obtain the rights to manage habitats, and/or to manage public use and access, if the seller is willing and we have funding available.

Activities Not Allowed
The 1997 Refuge Improvement Act states that "compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System." Compatible hunting, fishing, wildlife observation and wildlife photography, and environmental education and interpretation are the priority general wildlife-dependent uses of the Refuge System. According to Service Manual 605 FW 1, these uses should receive preferential consideration in refuge planning



Paul Casey/USFWS

Sunset on Harper's Meadow

and management before the refuge manager analyzes other recreational opportunities for appropriateness and compatibility.

We have received requests for non-priority, non-wildlife dependent activities that have never been allowed on this refuge. Activities evaluated by the refuge manager and determined not to be appropriate on refuge lands include: sled dog mushing, mountain biking, horseback riding, ATV, ORV and motorcycle use, competitions or organized competitive group events (e.g. fishing derbies, dog trials, or mountain bike, cross-country skiing, and boat races), and geocaching. Appendix C documents the refuge manager's decision on their appropriateness. Most of these activities are sufficiently provided elsewhere nearby on other ownerships, so the lack of access on the refuge does not eliminate the opportunity in the Umbagog Lake area. According to Service policy 603 FW 1, if the refuge manager determines a use is not appropriate, it can be denied without determining compatibility.

An important role of the proposed Umbagog Lake Working Group would be to evaluate these activities across jurisdictions and agree on if, or where, opportunities are best suited and should be encouraged on other ownerships. A cooperative outreach program could then be developed, consistent among the agencies managing the lake and its surroundings, to minimize confusion and facilitate outreach and enforcement.

Refuge Operating Hours

All of the alternatives will open the refuge for public use from ½ hour before sunrise to ½ hour after sunset, seven days a week, to insure visitor safety and protect refuge resources. The only regular exception is for overnight use by visitors with camping permits in designated camping sites. However, the refuge manager does have the authority to issue a special use permit to allow others access outside these timeframes. For example, research personnel or hunters may be permitted access at different times, or organized groups may be permitted to conduct nocturnal activities, such as wildlife observation, and educational and interpretive programs.

Changing the Refuge's Name

Under all alternatives, we propose to change the name of the refuge to "Umbagog National Wildlife Refuge" for several reasons. The refuge consists of lake, riverine, and significant uplands habitats. The current name focuses entirely on the lake. In addition, an expansion of riverine and upland habitats is proposed under alternatives B and C, some of which lies as far as 6 miles from the lake. Also, this is a name recommended to us by local residents. We believe the new name is a better representation of the broader geographic context and management emphasis we would pursue under all alternatives.

Adaptive Management

All alternatives will employ adaptive management as a strategy to ensure we respond quickly to new information or events. The need for adaptive 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.

We must adapt our strategies to respond to new information and/or spatial and temporal changes or environmental events that may or may not have been predicted. We will continually evaluate management actions, both formally and informally, through monitoring or research, to consider whether our original assumptions and predictions are still valid. In that way, management becomes a proactive process of learning what really works.

The refuge manager is responsible for changing management strategies if they do not produce the desired conditions. Significant changes may warrant additional NEPA analysis and public comment. Minor changes will not, but we will document them in project evaluation reports, or in our annual reports.

Generally, we can increase monitoring and research that support adaptive management without additional NEPA analysis, and assuming the activities, if conducted by non-refuge personnel, are determined compatible by the refuge manager in a compatibility determination. Many of our objectives identify monitoring needs. Our HSIMP will determine what is planned in the foreseeable future. See discussion on additional NEPA analysis requirements below. Implementing this strategy supports all seven refuge goals.

Additional NEPA Analysis

NEPA generally requires site-specific analysis and disclosure of impacts in either an environmental assessment (EA) or an EIS for all major federal actions. Other routine activities are categorically excluded from the NEPA requirements to prepare detailed environmental documents. Those generally include administrative actions, and are listed in chapter 4.

The major actions and associated impacts that are proposed in the three alternatives we analyzed in this document are described in enough detail to comply with NEPA, and would not require additional environmental analysis. Although this is not an all-inclusive list, the following project examples fall into this category: the HMP, including its forest and wetlands habitat management programs; the HSIMP; the FMP; expanding or reducing priority public use programs, including the fishing program, but excepting the hunting program; new visitor services infrastructure planned; development of a new headquarters and visitor contact facility; controlling invasive plants; and, implementing a furbearer management program.

We acknowledge that the proposed additions to the hunt programs under alternatives B and C are not analyzed in sufficient detail in this document to comply with NEPA and would require further environmental analysis before implementation. Under both alternatives, we propose that within 1 year of CCP approval, we would initiate a new Hunt Plan package, including associated NEPA document, Federal Register notice, and public involvement.

Actions Common to Alternatives B and C Only

Implementing Forest Management to Achieve Habitat Objectives

Alternatives B and C propose forest management, including tree cutting, as one of several tools to achieve respective habitat objectives for the Federal trust resources, specifically the refuge focal species, identified in goal 3. Under both alternatives, all commercial and non-commercial tree cutting would adhere to accepted silvicultural prescriptions, and the best management practices in each respective state at a minimum. Appendix K, “Forest Management Guidelines” describes desired future conditions, silvicultural methods and treatments, and other operational guidelines we would utilize, and identifies proposed locations

for management. However, these details may be refined as we acquire site-specific stand exam data.

Regardless of alternative, we expect that forest management to support habitat and focal species objectives in the next 15 years would primarily occur on Service-owned fee lands within the current, approved refuge boundary and in the management units identified in appendix K. In particular, at this time we do not predict that we would conduct any commercial tree cutting in the proposed expansion areas during the 15 year life of this CCP for several reasons. We cannot accurately predict, but assume it is years away, when we would acquire forest tracts large enough to make a meaningful forest management unit and to create an economically-viable, commercial harvest operation. In addition, once acquired, and assuming funds are available for project work, we would need to conduct a stand exam; map habitat management units and management operational zones; develop management prescriptions; conduct field site-prep and layout work; and, write and implement a contract. However, more importantly, it is our expectation that any forested lands acquired in the proposed expansion areas within the next 15 years, would be harvested to a low stocking density by the current owner before property transfer, and thus, would preclude a commercial harvest in support of our management objectives. This has been our experience with past refuge acquisitions of forested lands. As a result, under either alternative B or C, we predict at this time that our management activities in the proposed expansion areas, within the 15 year life of this CCP, would be more pre-commercial operations in nature, such as thinning, habitat restoration (e.g. restoring log landings, slash piles, etc), and/or vegetation manipulations to create openings and enhance woodcock habitat in woodcock focus areas (map 2-2).

Prior to implementing any forest management under alternatives B and C, we would plan to collect detailed stand-level information in the proposed forest management areas to insure that management prescriptions and decisions are based on the best available information. Additional strategies are noted below. Implementing this program supports refuge goal 3 relating to the conservation of upland forest habitats.

Strategies:

- Hire a forester and begin a detailed forest inventory and stand map on currently owned refuge lands; within 4 years of CCP approval, complete a forest management plan, amending the HMP as warranted. Consider using a contractor to conduct field work if a forester position is not filled, so that timeframes can be met.

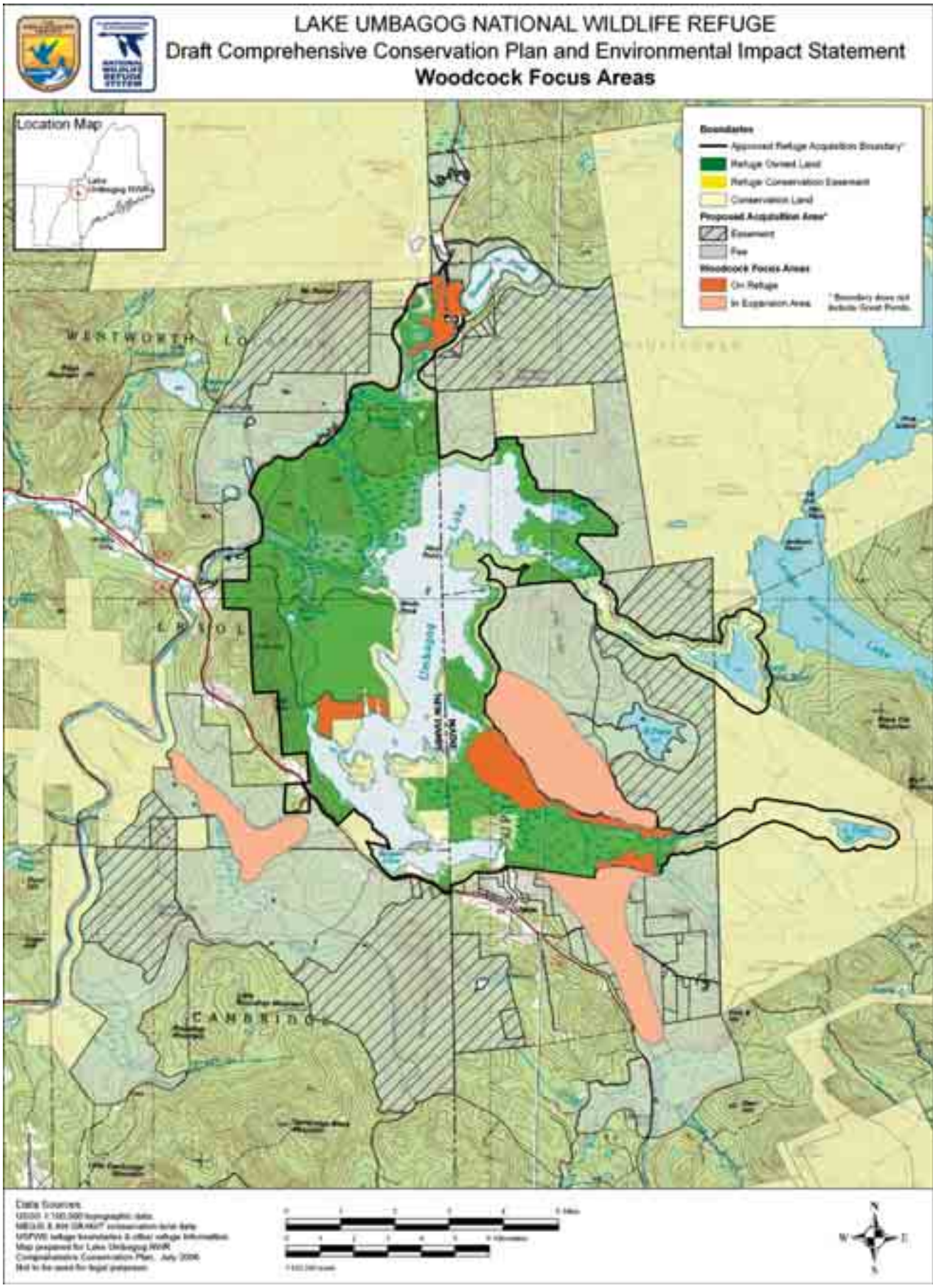
- On lands we acquire in the future with management potential, and if they are acquired in at least 200 acre contiguous, viable management units, we would plan to complete a stand-level evaluation, and map habitat management units and management operational zones within 2 years of acquisition; amend the HMP as warranted.

Forest regeneration on refuge land

Bill Zimi/USFWS

Implementing a Furbearer Management Program

Furbearing mammals are an important component of the refuge ecosystem helping to achieve refuge objectives. For example, beaver and muskrat can enhance wetlands habitats. However, there are


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Woodcock Focus Areas
Location Map
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Refuge Conservation Easement
Conservation Land
Proposed Acquisition Area*
Easement
Fee
Woodcock Focus Areas
On Refuge
In Expansion Area
* Boundary does not include Great Ponds.
WENTWORTH
LOVEWELL
BRIGHTON
CAMBRIDGE
Umbagog
Lake
Data Sources:
Map prepared for Lake Umbagog NWR
Comprehensive Conservation Plan, July 2006
Not to be used for legal purposes.

times when individual animals, or local populations of animals, impact our ability to achieve priority resource objectives. Protecting human health and safety, maintaining roads, trails, houses and other infrastructure, as well as concerns with impacts on other native wildlife and habitats are a few of the reasons furbearers might need to be managed. Both non-lethal and/or lethal techniques could be employed in any given situation. Trapping is one tool that would be used at the refuge manager's discretion to achieve an administrative or resource management objective. Secondarily, it also serves to provide a natural resource-based activity that is steeped in this area's history and cultural traditions. We would allow only state-licensed trappers under respective state's and refuge regulations. Implementing this program supports refuge goals 1-3 relating the conservation of open water, wetlands, floodplain, lakeshore and upland forest habitats.

Strategies:

- Within 2 years of CCP approval, develop a furbearer management plan; establish furbearer management units as warranted; identify where habitat management or reintroductions, increases, or reductions of native furbearer species, such as beaver, is desirable
- Work with States of New Hampshire and Maine to determine local population estimates and how refuge fits into respective state's management strategies
- Require a permit and reporting system in order to be able to distribute and monitor trapping effort by management unit

Providing Visitor Services

In conjunction with the proposal to develop a new administrative and visitor contact facility, alternatives B and C propose to construct a series of interpretive trails at the Potter Farm site. A conceptual design and tentative location for a Potter Farm trail were identified by Oak Point Associates in their report. The proposed trail is approximately 2 miles long, and would be designed to allow travel by people with disabilities.

Alternatives B and C also propose additional visitor facilities along major travel routes, including roadside pullouts on Routes 16 and a roadside pullout with overlook platform on Route 26. Each of these sites would have an information kiosk, and provide parking for several vehicles. Both alternatives include a ¼ mile loop extension to the Magalloway River trail accessible to people with disabilities (see maps 2-8 and 2-12). Each of these projects would facilitate wildlife observation, nature photography and interpretation of the refuge's resources. Implementing these activities would support goals 4 and 5 relating to opportunities for high quality hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

Alternatives or Actions Considered but Eliminated From Detailed Study

1. Allow a commercial entity to run campsites on refuge lands.
Since the refuge was established, a cooperative management partnership between state and federal agencies has been in place to conserve the unique wildlife habitat and recreational experiences at Umbagog Lake. Having the NH DRED- Division of Parks and Recreation manage the remote lake campsites on the refuge, as well as on those on adjacent state lands, provides maximum flexibility in campsite management on the lake. This arrangement allows us to work directly with the state to adjust campsite locations, level of use, and time of operation, in order to meet our biological objectives. Given this consideration, allowing a commercial entity to run the camp sites was eliminated from further study.

2. Recommend Errol dam removal.
This alternative was considered not practicable, due to the current hydroelectric facility and the significant impact to the local socio-political environment. Additionally, insufficient information is known on the effect such an action would have on existing refuge resources.

3. Recommend the Service purchase and manage the dam, or advocate for another conservation owner to purchase the dam.
Insufficient information is available to determine if current management is having a significant effect on refuge resources, or if alternative management would assist the refuge in accomplishing our goals and objectives. Further study is required to appropriately evaluate this action. The current hydroelectric FERC license will not expire within the timeframe of this CCP. This potential alternative may be considered in future revisions of this CCP.

4. Petition FERC to reopen the license and renegotiate the terms.
As stated above, additional evaluation and research is needed to appropriately address this action. It is not recommended at this time. If sufficient and credible information is obtained over time indicating negative impacts to refuge resources, the Service would reconsider this option. This alternative may also be considered in future revisions of this CCP.

5. Manage the refuge's forests for present net value and operate similar to a commercial private timber company.
The 1997 Refuge Improvement Act identifies wildlife conservation as the refuge's primary mission. Commercially-driven forest management actions may meet some of the refuge's biological goals and objectives. In those cases, we may manage similar to a private timber company; however, insuring a profit would not be the principal motivating factor for the management prescriptions. Rather, our management objectives would be based on providing the greatest benefit to focal species, their habitats, and other resources of concern. This alternative was not

Tyler Cove

Paul Casey/USFWS

Fall colors on the refuge

USFWS

fully developed because, in and of itself, it would not meet the goals and objectives we have established for the refuge.

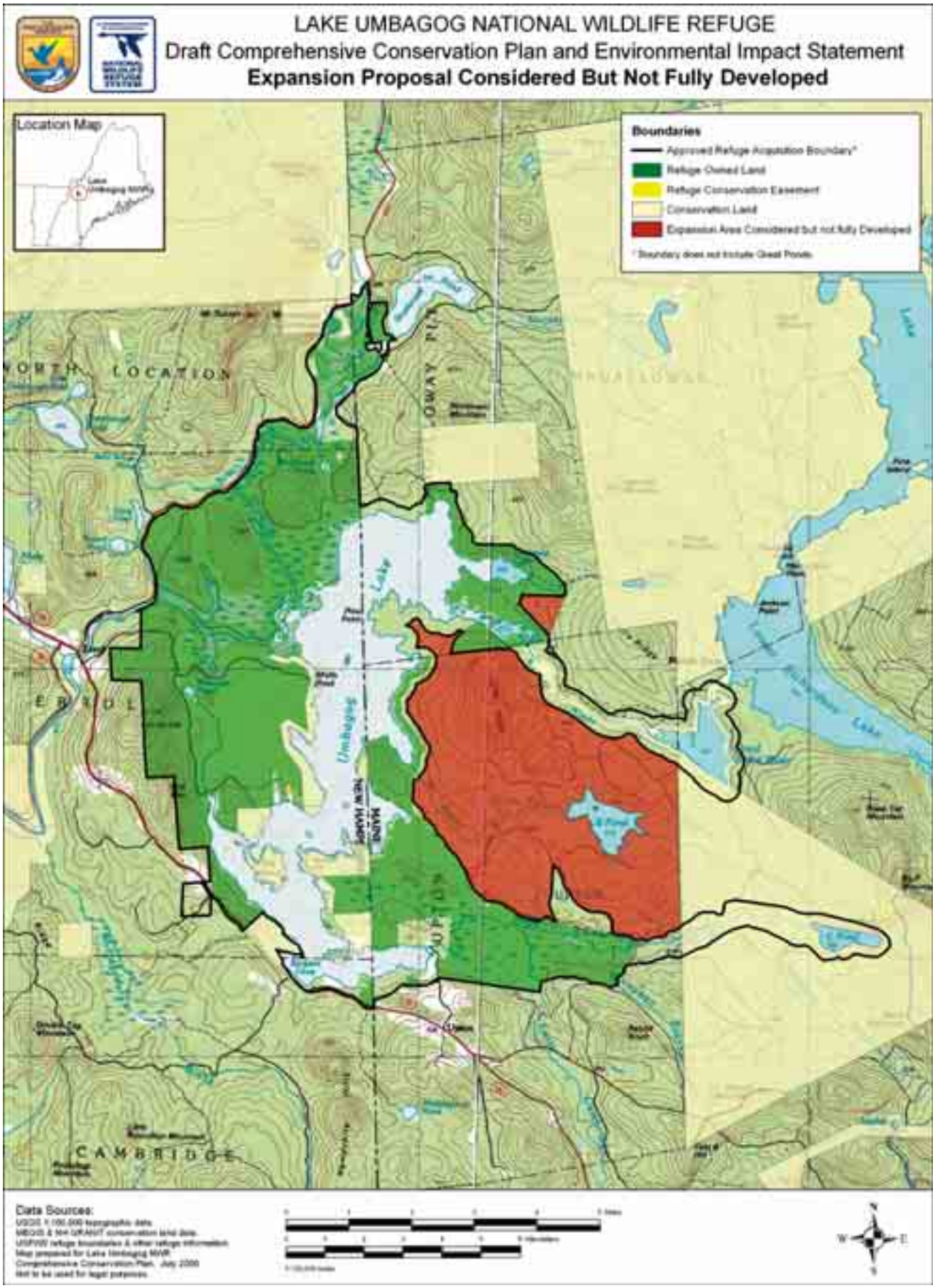
6. Consider a refuge expansion alternative that includes only the approximately 8,578 upland acres in Upton, Maine that was identified for protection by the Lands for Maine's Future Board in the original 1991 refuge decision document (map 2-3).

In the 1991 decision to establish the refuge, there was a recommendation, based on agreements with state partners during the cooperative planning effort, that certain lands adjacent to the refuge be acquired by respective state agencies to insure the permanent conservation of the lake and its resources. Most of the lands originally identified are in conservation status except for an area in Upton, Maine including B Pond and B Brook. The state of Maine has not conserved these lands to date and it does not appear they will have the resources to do so. This entire area, approximately 8,578 acres, is encompassed within both our alternative B and C expansion area proposals. As such, it is included as part of a larger conservation proposal. In our opinion, it is an important component of both expansion proposals, but in and of itself, would not achieve our goal to make a significant contribution to the conservation of the wildlife resources in the Northern Forest.

Alternative A. Current Management

Introduction

This alternative portrays current, planned, or approved management activities, and is the baseline for comparing the other two alternatives. Our biological program would continue its present priorities such as: cooperating with partners in the monitoring of loon, bald eagle, and osprey populations on the lake; protecting loon, bald eagle, and osprey active nest sites from human disturbance on refuge lands; and, conducting annual bird and amphibian inventories according to regional protocols. We would continue these projects with the help of volunteers, our conservation partners, and using our own staff as funding and staffing allow. Biological research studies would continue to be facilitated if they would benefit the Service and are determined compatible by the refuge


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Expansion Proposal Considered But Not Fully Developed
Location Map
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Refuge Conservation Easement
Conservation Land
Expansion Area Considered but not fully Developed
*Boundary does not include Great Ponds
NORTH LOCATION
ERROL
CAMBRIDGE
Umbagog
Lake
NEW HAMPSHIRE
MAINE
Data Sources:

manager. Map 2-4 depicts the broad habitat types we predict would result under implementation of alternative A management objectives after approximately 100 years. This map should be compared to maps 2-7 and 2-11, predicting the long-term habitat changes under alternative B and C implementation, respectively. The acreage figures presented are approximations based on GIS mapping from several data sources.

With regards to visitor services, we would continue to offer hunting and fishing opportunities on refuge lands, and respond to requests for interpretive and school programs; however, we would not to be able to meet most requests due to limited staff and resources. We would also continue to partner with the State of New Hampshire to provide remote camping sites on Umbagog Lake. Snowmobiling would continue to be allowed with use confined to the designated trails. The Magalloway River Trail would continue to be the only walking trail maintained on the refuge. We would continue to coordinate two annual community events: the Wildlife Festival, and Take Me Fishing. Map 2-5 depicts the public use facilities under current management.

We would continue to seek acquisition from willing sellers of the 6,392 acres that remain within our currently approved acquisition boundary.

Goal 1 Manage open water and wetlands to benefit Federal trust species and other species of conservation concern.

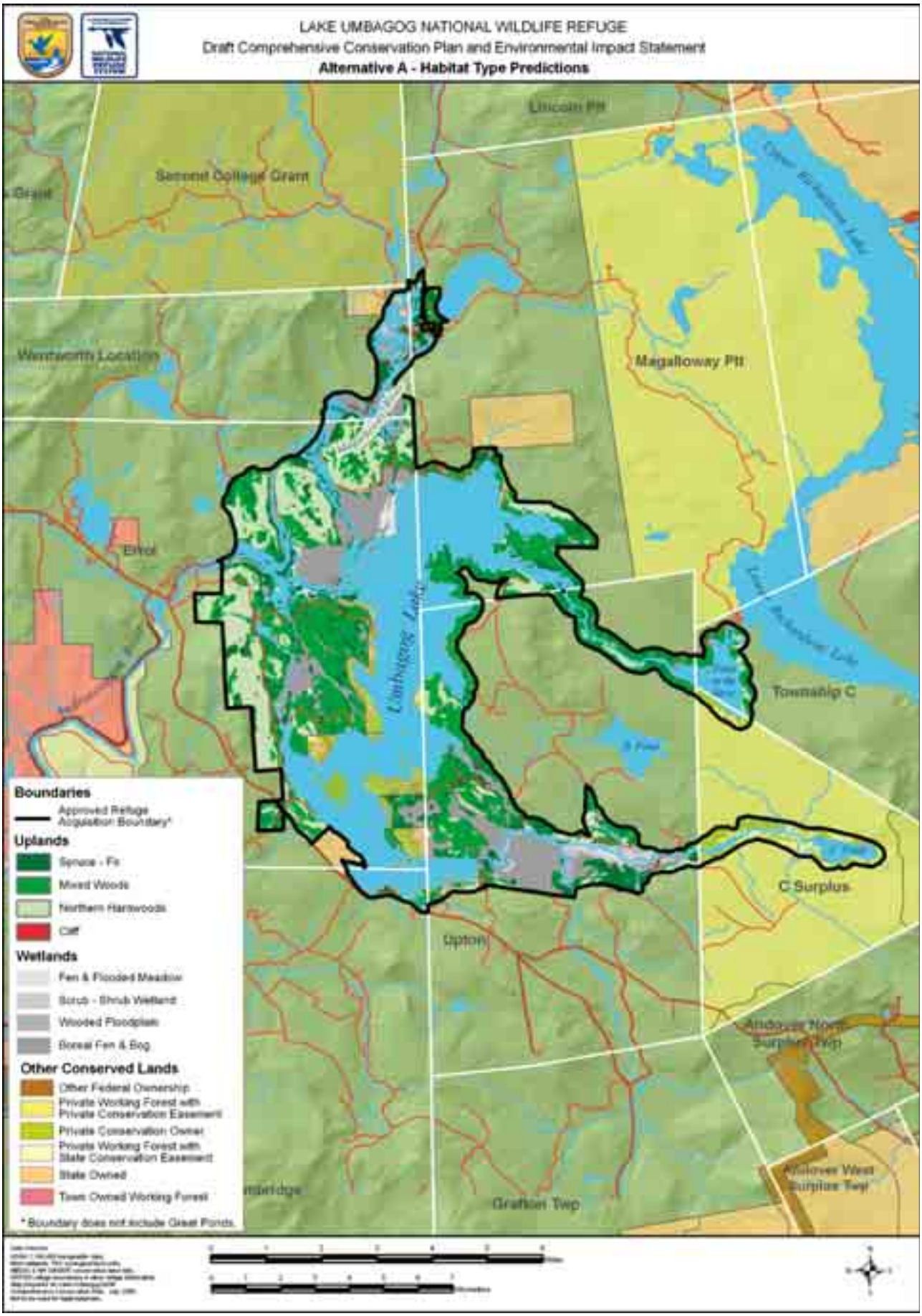
Objective 1.1 (Fen and Flooded Meadow)
Manage 555 acres of fen and flooded meadow within the existing, approved refuge boundary for breeding and migrating American black duck, and other waterfowl species of conservation concern, including ring-necked duck, common goldeneye, and common and hooded merganser.

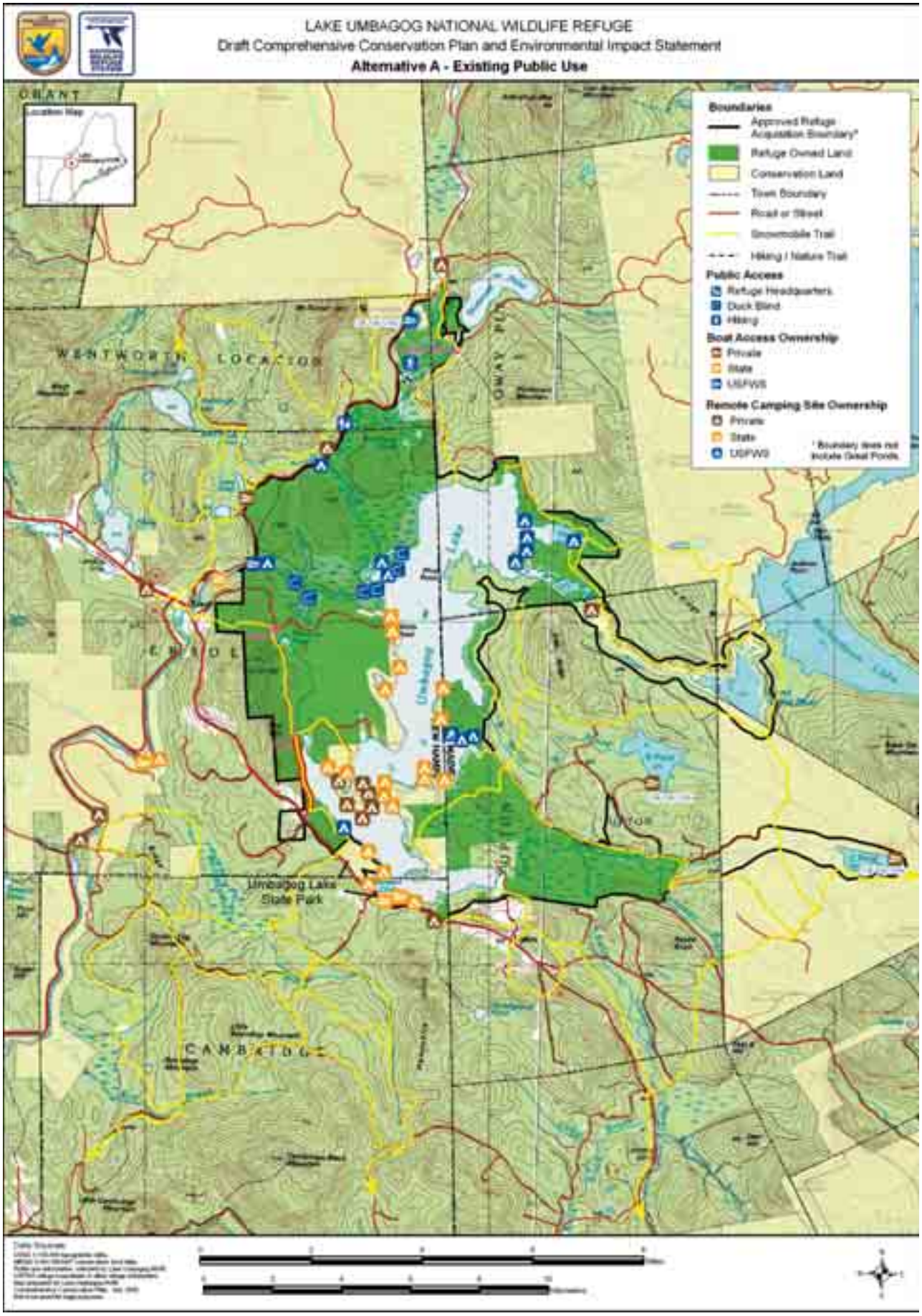
Rationale
Umbagog Lake is identified as one of three waterfowl focus areas in New Hampshire under the NAWMP (Atlantic Coast Joint Venture 2005). The Refuge supports the highest concentrations of nesting black ducks and ring-necked ducks in New Hampshire (USFWS 1991). The black duck is a species of concern in the NAWMP because of the historic decline in their population, with habitat loss an important contributing factor. The regional importance of Umbagog Lake to black duck was one of the reasons the refuge was established. Though black duck populations are stable or increasing, they are listed as highest priority for conservation in BCR14 (Dettmers 2005).

American black duck

S. Maslowski/USFWS

Other important justifications for establishing the refuge were: conserving the regional ecological significance of the wetlands including and surrounding Umbagog Lake; conserving the diversity of wildlife supported by these wetlands, including several rare and declining species; and, the protection of water quality. Refuge designation was encouraged to ensure the permanent protection of important wetlands since land development and other land use changes seemed imminent and had the potential to adversely impact the biological integrity, diversity, and health of these wetlands habitats. Wetlands protection and management is the most important goal we have identified in this CCP.


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Alternative A - Habitat Type Predictions
Lincoln Plt
Second College Grant
Wentworth Location
Megalloway Plt
Errol
Umbagog Lake
Township C
C Surplus
Upton
Grafton Twp
Boundaries
Approved Refuge Acquisition Boundary*
Uplands
Spruce - Fir
Mixed Woods
Northern Hardwoods
Cliff
Wetlands
Fen & Flooded Meadow
Scrub - Shrub Wetland
Wooded Floodplain
Boreal Fen & Bog
Other Conserved Lands
Other Federal Ownership
Private Working Forest with Private Conservation Easement
Private Conservation Owner
Private Working Forest with State Conservation Easement
State Owned
Town Owned Working Forest
* Boundary does not include Great Ponds.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Alternative A - Existing Public Use
Location Map
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Conservation Land
Town Boundary
Road or Street
Snowmobile Trail
Hiking / Nature Trail
Public Access
Refuge Headquarters
Duck Blind
Hiking
Boat Access Ownership
Private
State
USFWS
Remote Camping Site Ownership
Private
State
USFWS
* Boundary does not include Great Ponds.
GRANT
WENTWORTH LOCATION
OGWAY PL
ENNIS
Umbagog Lake
Umbagog Lake State Park
CAMBRIDGE

Besides continuing to acquire land from willing sellers within our approved refuge boundary, our current management strategy in this habitat type is "passive." Our definition of passive management is "to protect, monitor key resources, and conduct baseline inventories to improve our knowledge of the ecosystem." In other words, we have not actively managed it, but have focused more on collecting baseline information to determine what vegetation is present in this habitat type; how it may be affected by changes in water level; what wildlife are using this habitat type; and what the potential threats are. The information we collect will help support future management decisions to benefit this habitat type and the species dependent upon it.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Repeat the aquatic invertebrate survey at wetland edges every 5 years to monitor system health and waterfowl food resources
- Continue to support research to determine the impacts of water level management on fen and flooded meadow habitat
- Continue to establish baseline inventory and permanent markers in this habitat type. Revisit these plots every 5 years.
- Continue spring and fall migratory shorebird and waterfowl surveys.
- Continue to conduct breeding marsh bird surveys according to Regional protocol
- Continue to acquire up to 73 acres of this habitat type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 1.1

Objective 1.2 (Boreal Fen and Bog)
Manage 1,281 acres of boreal fen and black spruce bog within the existing, approved refuge boundary, including the Floating Island National Natural Landmark, to conserve the diversity of wetlands and to provide watershed protection consistent with the refuge's establishment purposes.

Rationale
Same as Objective 1.1

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Continue to establish baseline inventory and permanent markers in this habitat type. Re-survey and photograph plots every 5 years.
- Continue to survey for birds, especially birds of conservation concern known in this cover type, such as palm warblers and rusty blackbirds, to evaluate implications from management on their habitat requirements.
- Continue to acquire up to 97 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 1.2

Objective 1.3 (Northern White Cedar)
Manage the 1,031 acres of northern white cedar forest within the existing, approved refuge boundary to conserve the diversity of wetlands and to provide watershed protection consistent with the refuge's establishment purposes.

Rationale
Same as Objective 1.1

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Continue to inventory small mammal and amphibians using this cover type
- Continue to acquire up to 202 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 1.3

Objective 1.4 (Scrub-Shrub Wetland)
Manage 899 acres of scrub-shrub wetland within the existing, approved refuge boundary to conserve the diversity of wetlands and to provide watershed protection consistent with the refuge's establishment purposes.

Rationale
Same as Objective 1.1

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Continue to support research to determine the impacts of water level management on this cover type
- Continue to acquire up to 244 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 1.4

Objective 1.5 (Open Water)
In partnership with the states of Maine and New Hampshire, manage the open water habitat within the existing, approved refuge boundary to maintain high quality loafing and foraging areas for waterfowl and other water birds, and to maintain high water quality to benefit other aquatic life.

Rationale
Same as objective 1.1

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Map distribution of submerged aquatic vegetation – species, density, size of beds.

Objective 1.6 (Common Loon)
Protect and monitor naturally occurring common loon nest sites on Umbagog Lake, in partnership with state of New Hampshire and Maine wildlife agencies,

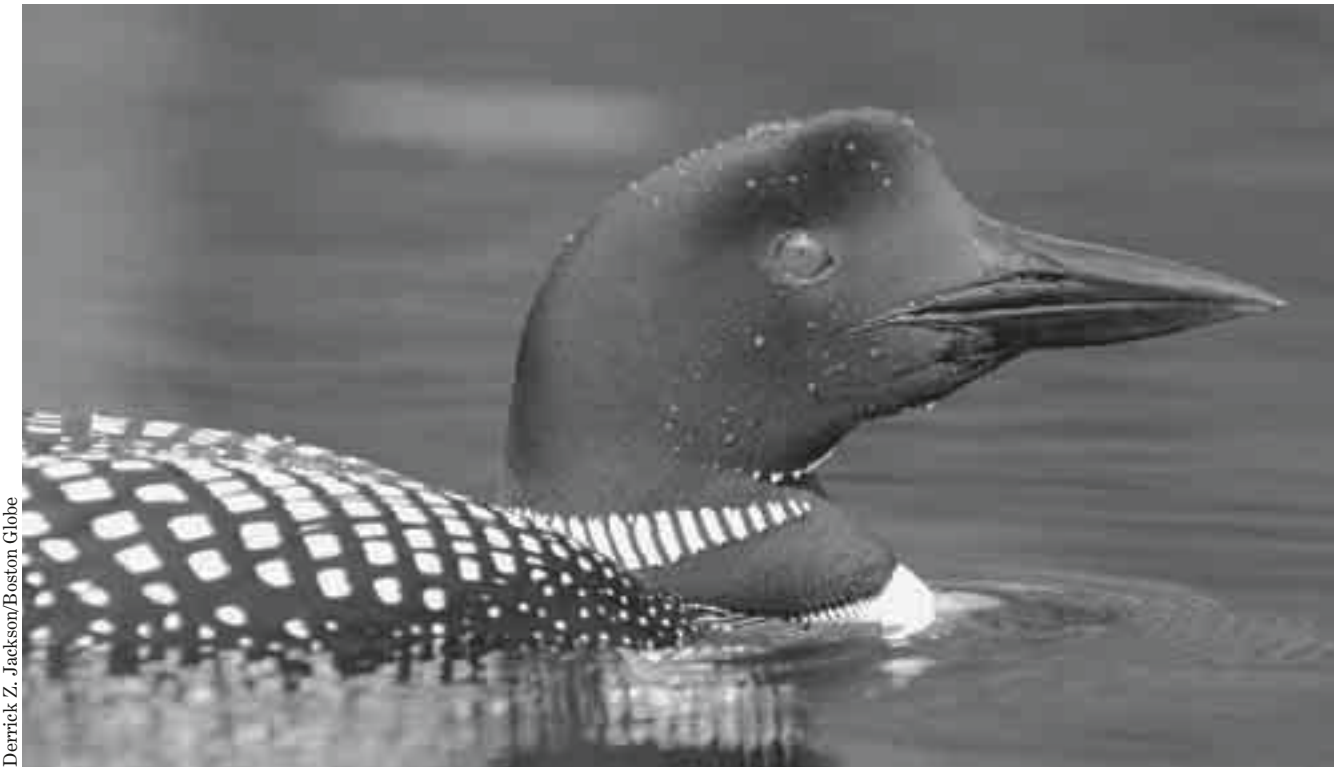
conservation partners and the holder of the FERC license for Errol Project, to serve as an "indicator species" for other wetland-dependent nesting wildlife.

Rationale
See rationale for alternative B, objective 1.6, for a description of the importance of common loon management on Umbagog Lake. With regards to water level management on Umbagog Lake, nesting common loon are regarded by the Service as the "indicator species" to represent the effectiveness of water level management on nesting wildlife.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this species:

- Continue to monitor loon populations in partnership with the states, conservation organizations, and the holder of the FERC license for the Errol Project
- Continue to support research to determine causes and implications for decline in number of loon territories on Umbagog Lake
- Continue annual meetings with FERC licensee or representative to advise on lake water levels to benefit nesting loon, within the conditions of the FERC license and Article 27
- Continue to protect active loon nests in spring and summer from predators and human disturbance using outreach and visitor contact, buoy lines, restricted access, and other tools as warranted
- Develop and maintain a permanent Umbagog Lake loon dataset in partnership with NHFG, MDIFW, and private conservation organizations

Common loon



Derrick Z. Jackson/Boston Globe

Goal 2 Manage floodplain and lakeshore habitats to benefit Federal trust species and other species of conservation concern.

Objective 2.1 (Wooded Floodplain)
Manage 1,293 acres of wooded floodplain within the existing, approved refuge boundary to provide watershed protection consistent with the refuge's establishment purposes. Also, continue to manage the 245 acre Magalloway River floodplain to maintain its 'exemplary' site status as identified by the NHNHI.

Rationale
Under goal 1, objective 1.1, we described the significance of the wetlands including and surrounding Umbagog Lake in the establishment of this refuge. While it is true that protection of the wetlands, associated wildlife, and water quality were cited as the primary reasons to create the refuge, the decision document and supporting environmental assessment also describe the importance of adjacent lakeshore and upland habitats to the protection of those wetlands and their watersheds (USFWS 1991).

Similar to the rationale for objective 1.1, since refuge establishment, we have focused on acquiring land from willing sellers to ensure adjacent land uses will not impact the resources the refuge was established to protect. Otherwise, our current management strategy in this habitat type is primarily passive. We have not actively managed it, except to restore some former cabin sites and unauthorized camp sites to native vegetation. Instead, we have been collecting baseline information, as funding and staffing allows, in support of future management decisions designed to benefit this habitat type and the species dependent upon it.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Continue to acquire 153 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current lands under objective 2.1
- Restore natural vegetation on unauthorized campsites
- Remove surplus cabins that we have acquired as funding allows. Restore site (e.g. loam, seed and/or plant) to native vegetation.
- Continue vernal pool, small mammal and amphibian surveys
- Continue to include this habitat type in breeding bird surveys

Objective 2.2 (Lakeshore Pine-Hemlock)
Manage 520 acres of lakeshore pine-hemlock within the existing, approved refuge boundary to provide wetlands and watershed protection consistent with the refuge's establishment purpose.

Rationale
Same as Objective 2.1

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this habitat type:

- Continue to monitor habitat impacts from public use

- Mitigate significant recreational impacts as needed
- Continue to record wildlife use of this habitat type
- Continue to acquire 288 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current lands under objective 2.2
- Also see objective 2.3.

Objective 2.3 (Bald Eagle and Osprey)
Protect and maintain super-canopy nesting trees for bald eagles, and protect all osprey nests within the existing, approved refuge boundary.

Rationale
See rationale for alternative B, objective 2.3, for a description of the importance of bald eagle and osprey management on Umbagog Lake.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting these species:

- Protect and maintain super-canopy nesting trees on current and future refuge lands.
- Inventory active and historic nesting sites each year
- Continue bald eagle and osprey surveys in conjunction with the States of Maine and New Hampshire, and conservation partners
- Maintain and/or install as warranted, predator guards on active nesting trees
- Continue to implement area closures around bald eagle nest trees; place visible floating buoys and signs to alert all boaters to closure area
- Continue to work cooperatively with State agencies and (Non -Governmental Organization) NGO's on bald eagle and osprey management
- Support efforts to eliminate practices that contribute lead and other contaminants to the environment

Goal 3 Manage upland forested habitats, consistent with site capabilities, to benefit Federal trust species and other species of conservation concern.

Objective 3.1 (Mixed Spruce-Fir/Northern Hardwood Forest Matrix)
Manage the refuge's upland forests, including its 3 habitat types: spruce-fir (approximately 2,565 acres); conifer-hardwood mixed woods (approximately 5,607 acres); and, northern hardwood (approximately 5,708 acres) on Service-owned lands within the existing, approved refuge boundary to provide watershed protection consistent with the refuge's establishment purposes.

Rationale
We define the "forest matrix" as the most extensive, most connected, and most influential landscape type across the Upper Androscoggin River watershed basin. Throughout the watershed, and including the refuge, the forest matrix is a mosaic of forest types and is described as an overall mixed spruce-fir/northern hardwood forest (see chapter 3 for more details). Within this mixed forest matrix;

Paul Casey/USFWS

Upland forest in winter

we identify 3 component forest habitat types: spruce-fir; conifer-hardwood mixed woods; and northern hardwood. The Umbagog Lake landscape of today supports a larger percentage of hardwoods than occurred over the last 150 years (Charlie Cogbill, personal communications, 2004). This reflects a forest composition that was affected by multiple cycles of timber harvesting over those 150 years. Selective harvesting of softwoods has converted many spruce-fir stands to mixed stands, and mixed stands to hardwood stands. In the absence of further human disturbance these forests through natural succession and disturbance patterns will shift to a higher proportion of softwood (Publicover and Weihrauch 2003).

We state in our rationale for objective 2.1 that the refuge was principally established to protect wetlands and associated habitats, and water quality. These resources are all potentially impacted by land uses in the adjacent uplands in the watershed, so protection of these uplands has also been a goal. Our primary management strategy has been to acquire these habitat types from willing sellers within our approved acquisition boundary. Otherwise, our current management strategy has been passive and we would continue to be focused on collecting baseline information and monitoring key resources.

Strategies

Spruce-fir Habitat Type

- Continue to acquire 618 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 3.1.

- Continue to work with state partners to identify and protect critical deer wintering yards (see map 2-9).

Mixed Woods Habitat Type

- Continue to acquire 2,129 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 3.1.

Northern Hardwood Habitat Type

- Continue to acquire 1,220 acres of this cover type still in private ownership within the existing, approved refuge boundary, from willing sellers, and manage similar to current refuge lands under objective 3.1.

Goal 4 Provide high quality wildlife-dependent activities such as hunting, fishing, wildlife observation, and photography.

Objective 4.1 (Hunting)
Continue to operate under the 2007 Amended Refuge Hunt Plan (USFWS, 2007).

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 very popular activity in the Umbagog Lake area and in other rural parts of New Hampshire and Maine.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue to offer a hunt program following state of Maine and New Hampshire regulations. The only exceptions are that we do not allow turkey hunting anywhere on the refuge and we do not allow bobcat hunting on refuge lands in Maine (on New Hampshire lands, bobcat hunting is not allowed by state or refuge regulations). Also, no special refuge permits are required for hunting on refuge lands.

- Continue to maintain six waterfowl hunt blinds; maintain a reservation system for the blinds where the maximum stay is one week

Objective 4.2 (Fishing)
Continue to allow access for fishing, in accordance with states of Maine and New Hampshire regulations, except in sensitive areas during wildlife nesting seasons.

Rationale
The rationale is similar to objective 4.1.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue annual "Take Me Fishing" event

- Continue to restrict fishing access around loon and bald eagle nesting sites

Objective 4.3 (Wildlife Observation and Photography)
Provide developed, accessible wildlife viewing and photography opportunities on the Magalloway River trail, and upon request, in the six waterfowl blinds.

Rationale
Wildlife observation and nature photography represent two of the six priority public uses to receive enhanced consideration on refuges according to the 1997 Refuge Improvement Act. Opportunities to view and photograph wildlife in a natural setting abound on this refuge due to its rural, undeveloped landscape. Moose and loon are two popular attractions that can be viewed roadside or from boats on the refuge's lakes and waters. The 1/3 mile Magalloway River trail, with its viewing platform along an oxbow of the Magalloway River, is the only walking trail maintained by the refuge. It is accessible to people with disabilities. A ¼ mile loop extension is planned for 2007-2008.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Maintain Magalloway River trail and viewing platform
- Evaluate new opportunities upon request

Objective 4.4 (Camping)
Continue to maintain the 14 remote campsites on refuge lands (12 lake sites; 2 on river) in their current locations to provide a unique hunting, fishing, wildlife observation and photography opportunity associated with an overnight stay on refuge lands.

Rationale
Remote camping on Umbagog Lake provides the unique opportunity to view and hear loons during dusk and dawn when they are most actively calling, while totally immersed in a quiet, private natural setting. It is becoming an increasingly rare experience, except in very remote northern areas. Camping is a very popular activity on Umbagog Lake and in other rural parts of New Hampshire and Maine. Over the past few years we have implemented several actions activities at those camping sites on refuge lands in order to minimize the impacts on natural resources. We are seasonally closing certain sites during the loon nesting season if they are in proximity to active territories. We are phasing in a probation on pets, to be completed in 2007, to minimize disturbance to wildlife and the noise disturbance to adjacent campers, namely from dogs barking. Also, eliminating pets reduces the contribution of feces waste. We have been recently placing limits on where campers can erect tents at certain sites to minimize soil and vegetation impacts. At certain sites we have initiated restoration projects, or modified site infrastructure, to reverse those impacts.

Strategies
- Close certain campsites which lie adjacent to loon territories during active loon nesting periods
- Prohibit pets by 2007
- Limit campsite size
- Maintain and improve campsites on an annual basis

Objective 4.5 (Boating)
Maintain one developed and one unimproved boat launch site, with no established restrictions on use, except limiting access to sensitive areas when they are closed during the wildlife nesting season.

Rationale
Canoes and kayaks are one of the most popular means of accessing Umbagog Lake and experiencing the refuge. We maintain two boat launch sites to facilitate this use. Motorized boat users primarily launch from off-refuge sites. We believe there has been a dramatic increase in boat use over the last eight years, but have not had the resources to measure this observation. Some of the indications have been increased boater conflicts observed by us, or reported to us, and the frequency that parked cars have overflowed onto the highways. We expect this

use to continue to increase, with a commensurate increase in conflicts among users, until or unless a coordinated plan to manage visitor use is developed among the agencies with jurisdiction on the lake.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue to maintain closures around certain bald eagle and loon nesting territories in partnership with the states
- Continue to distribute pamphlet on recommended day-use canoe and kayak trails, which also alerts boaters to closed areas.
- Continue to monitor boat use by counting numbers from a fixed location on peak use days
- Continue to coordinate with states to address increased use

Goal 5 Develop high-quality interpretative opportunities, and facilitate environmental education, to promote an understanding and appreciation for the conservation of fish and wildlife and their habitats, as well as the role of the refuge in the Northern Forest.

Objective 5.1 (Interpretative Programs)
Respond to requests for interpretive programs as time and staffing permits with programs focusing on the Refuge System mission and refuge purposes.

Rationale
Interpretation is one of the six priority public uses required by the 1997 Refuge Improved Act to receive enhanced consideration on refuges. Given our small staff size and available funding, it has been necessary to make hard decisions on where our resources should be allocated. We have chosen to focus on our biological program priorities, and have limited ourselves to responding to only a few requests for specific interpretive programs each year. Currently, we are not able to meet the demand for these programs.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue to hire up to two seasonal interns/year, if resources allow, to help accomplish visitor services program priorities
- Continue to offer programs on a request basis only; usually a minimum of 3, and up to a maximum of 12 annually, focused on presenting the Refuge System mission and refuge purposes. Typical audiences have been students or senior citizen groups
- Develop and distribute standard interpretive brochures (e.g. refuge brochure, species lists, etc)
- Continue to seek funding to finish construction of the Magalloway River trail, with interpretive signage, and make it Americans with Disability Act (ADA) compliant

- Continue to develop/construct self-guided Magalloway River Canoe Trail and boat access

Ian Drew/USFWS

Activities at the Wildlife Festival

Ian Drew/USFWS

Objective 5.2 (Community Outreach)
Provide at least 2 opportunities each year to raise awareness within the local community and among summer visitors about the refuge and its resources.

Rationale
It is particularly important that local year round and seasonal residents and regular summer visitors understand, appreciate, and support the Refuge System mission and this refuge's unique contribution to that mission. It is through these outreach efforts that we hope to garner support for refuge management priorities. In addition, through this outreach, our volunteer program could grow, and our Friends group could see enhanced membership and support.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue to coordinate a minimum of 2 visitor outreach events annually that showcase refuge resources; for example, the Wildlife Festival and Take Me Fishing event

- Continue to distribute brochure and literature on impacts to loons and other wildlife from lead fishing tackle to discourage their use

Goal 6 Enhance the conservation and management of fish and wildlife resources in the Northern Forest Region through partnerships with public and private conservation groups, private landowners, State and local entities.

Objective 6.1 (Partnerships)
Continue to work cooperatively with regional partners engaged in conservation-based regional and community development activities consistent with the Refuge System mission and refuge purposes.

Rationale
The refuge has benefited immensely from our existing partnerships in a variety of ways. These include: the sharing of technical expertise to support wildlife and public use management decisions; research that provides valuable information on refuge resources; collaborative land conservation planning to insure that important wildlife habitat is conserved throughout the Northern Forest, and cooperative outreach and enforcement of refuge regulations. These activities have particularly benefited us as we have not always had the resources to accomplish this work on our own.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue to work with such partners as:

Conservation organizations: Trust for Public Lands, The Nature Conservancy, Audubon Society of New Hampshire (ASNH), Loon Preservation Committee, New England Forestry Foundation, Mahoosic Land Trust, Society for the Protection of New Hampshire Forests, Androscoggin Watershed Council, Rangeley Lakes Heritage Trust, The Conservation Fund, Trout Unlimited;

Spruce-fir forest

Bill Zinni/USFWS

Town and county governments: Towns of Upton, Errol, Magalloway Plantation, and Coos County;

Private entities: FPLE, Wagner Forest Management;

Universities and other educational institutions: Dartmouth College, University of Vermont, University of Massachusetts, Hurricane Island Outward Bound, The Chewonki Foundation, and the Northwoods Stewardship Center; and,

State agencies: MDIFW, NHFG, NH DRED; and, NH Office of Energy and Planning.

Objective 6.2
Continue to promote responsible use of Umbagog Lake and its tributaries on the refuge.

Rationale
Umbagog Lake is one of the crown jewels in the Northern Forest lake system and has increased in popularity over the last decade as a destination. As we described under objective 4.5 above, we expect visitor use to continue to increase, with a commensurate increase in user conflicts. We recognize that it is imperative that we promote, through as many forums as possible, responsible use of the lake. We have also suggested the need to develop a coordinated management plan among the agencies with jurisdiction on the lake to manage visitor use.

Strategies
In addition to those strategies listed under "Actions Common to All of the Alternatives" affecting this program:

- Continue to include instruction on boater safety and responsible fishing at the annual "Take Me Fishing" event.
- Continue to include instruction on "Leave No Trace" ethics, boater safety, and responsible fishing at the annual "Wildlife Festival."
- Continue to work with state partners to manage public use in ways that benefit wildlife, such as implementing access closures around sensitive nesting areas.

Alternative B. Management for Particular Habitats and Focal Species (Service-preferred Alternative)

Introduction

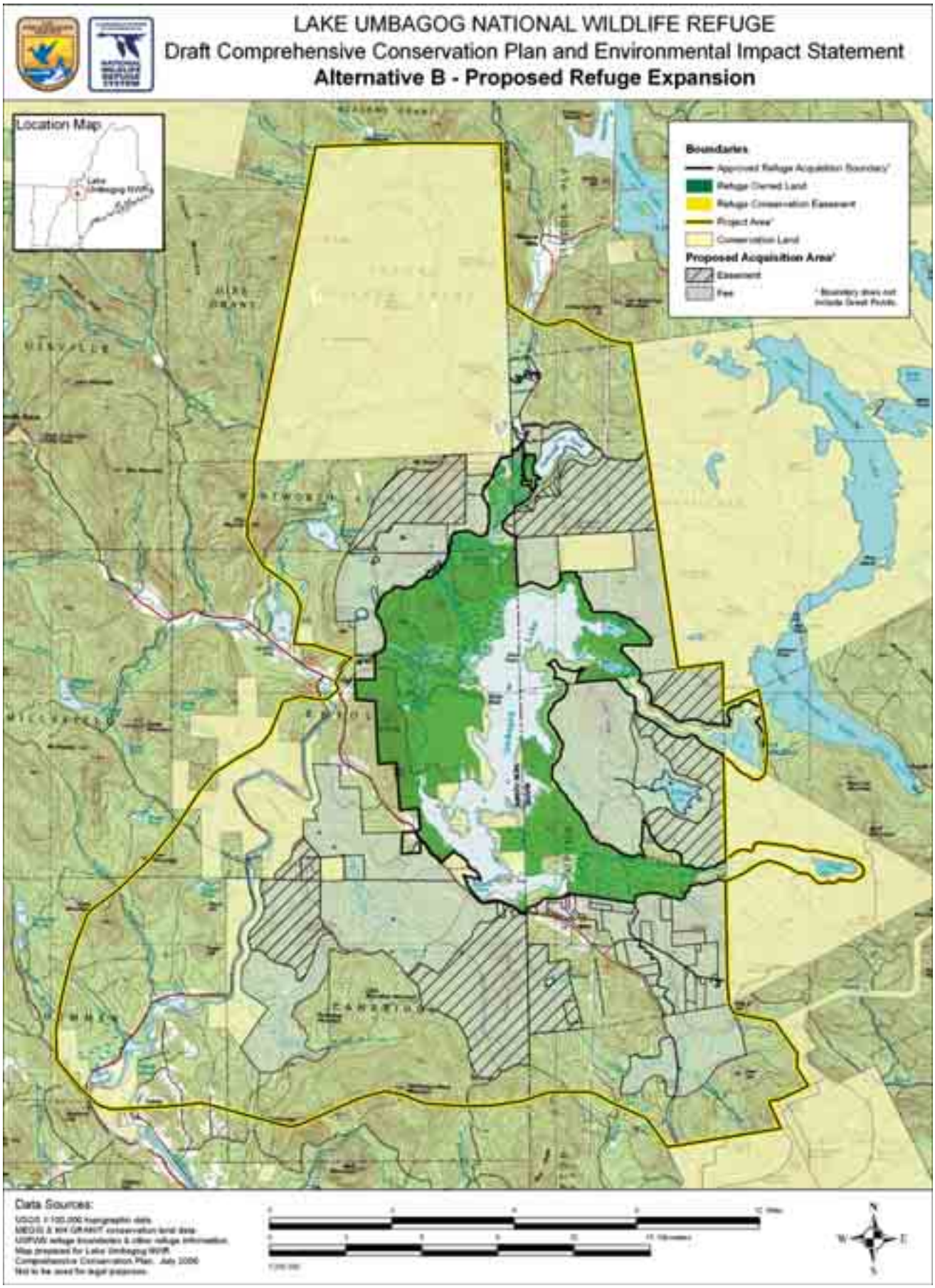
Alternative B is the alternative our planning team recommends to our Regional Director for implementation. It includes an array of management actions that, in our professional judgment, work best towards achieving the refuge's purposes, the vision and goals, and would make an important contribution to conserving Federal trust resources of concern in the Northern Forest. It is the alternative that would most effectively address the significant issues identified in chapter 1. We believe it is reasonable, feasible, and practicable within the 15-year timeframe.

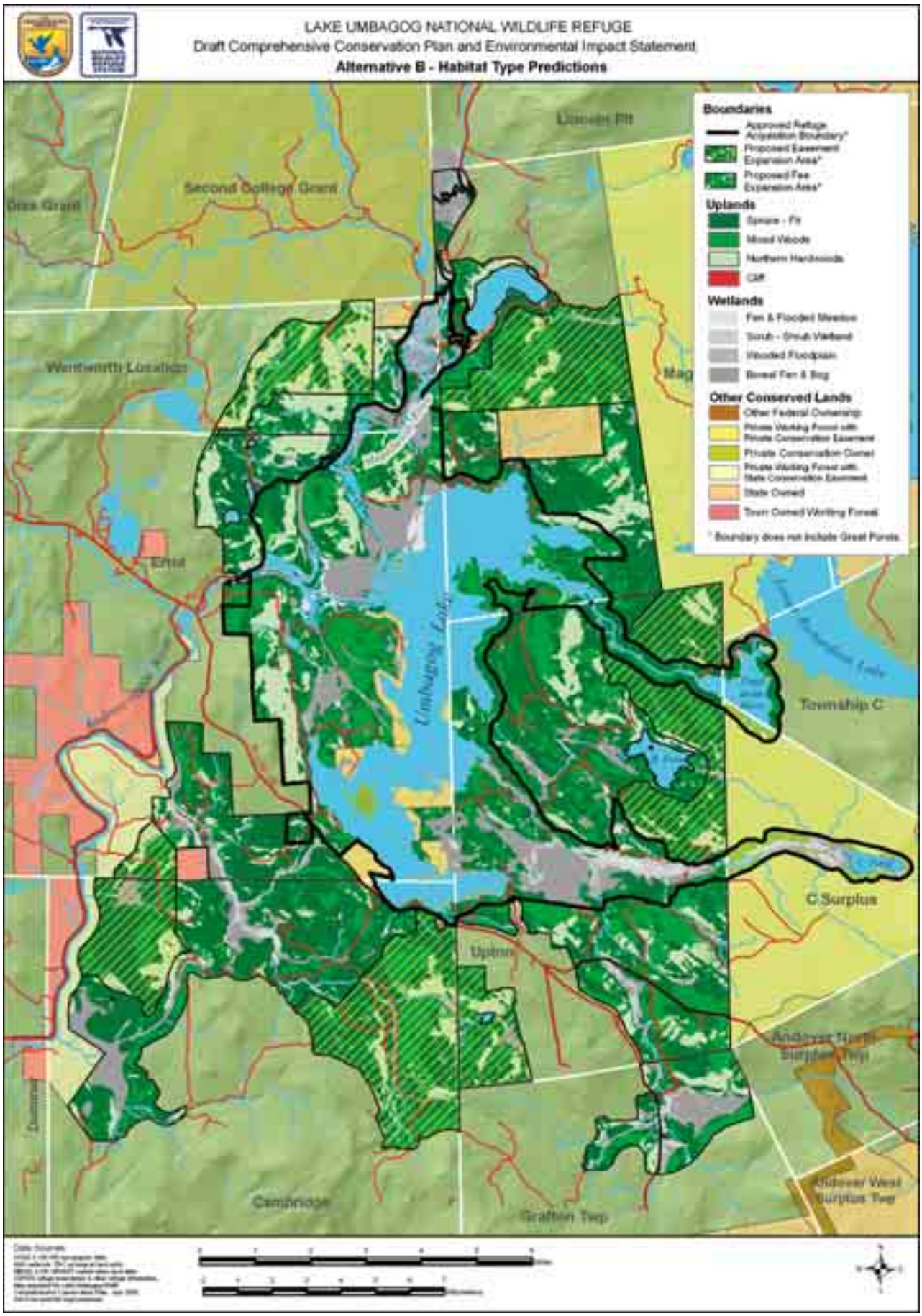
This alternative is designed to emphasize the conservation of a mixed forest matrix landscape and its component habitat types for which we believe the refuge can make the most important ecological contribution within the Upper Androscoggin River watershed, the larger Northern Forest landscape, and the Refuge System. The habitat types we describe support a wide variety of Federal trust resources, in particular, birds of conservation concern identified in the BCR 14 region and wetlands. We identify "focal species" for each habitat type objective, whose life requirements would guide management activities in that respective habitat type. Focal species were selected because they are Federal trust resources whose habitat needs, in our opinion, broadly represent the habitat requirements for a majority of other Federal trust species and native wildlife dependent on that respective habitat type.

Appendix N describes in greater detail our process for selecting habitat types and focal species. Our objective statements for Goals 1-3 below identify the habitat type, acres to be conserved, and the focal species that will be a target of our management. An accompanying rationale statement identifies each focal species' particular habitat needs. The strategies represent potential management actions for accomplishing the objectives and meeting those habitat needs. Map 2-7 depicts the broad habitat types we predict would result after approximately 100 years of implementing alternative B management objectives for upland habitats.

Similar to alternative A, and in keeping with the original purposes for which the refuge was established, the wetlands objectives under goal 1 are our highest priority biological objectives to implement. Protecting the biological integrity, diversity, and environmental health of Umbagog Lake and its associated rivers is paramount. As our second highest habitat management priority under alternative B, we propose implementing the objective under goal 3, which would promote and sustain a mixed forest matrix; that is, a mosaic of spruce-fir, mixed woods, and northern hardwood habitat types, with emphasis on promoting the conifer component. Our analysis indicates that the refuge is in a unique position, based on site capability and natural potential, to make an important contribution to the mixed forest matrix in the watershed, as well as in the larger Northern Forest landscape, and within the Refuge System. As our third habitat management priority, we propose to implement those actions that would improve American woodcock habitat. These actions are identified under objectives 1.4, 2.1, and 3.1.

In support of these priorities, and our other habitat goals and objectives, alternative B proposes to expand the existing, approved refuge boundary by 49,718 acres through a combination of Service fee-simple (65%) and conservation easement (35%) acquisitions (map 2-6). All lands proposed for acquisition are: undeveloped; either are or have the potential to be high quality wildlife habitat; occur in an amount and distribution to provide us management flexibility to achieve our habitat goals and objectives; and, would collectively result in a land base that affords a vital linkage to other conserved lands in the Upper Androscoggin watershed and Northern Forest region. As we acquire lands in fee, we would manage them by the goals, objectives, and strategies under this alternative.


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Alternative B - Proposed Refuge Expansion
Location Map
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Refuge Conservation Easement
Project Area*
Conservation Land
Proposed Acquisition Area*
Easement
Fee
* Boundary does not include Great Pondo.
Data Sources:


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Alternative B - Habitat Type Predictions
Boundaries
Approved Refuge Acquisition Boundary*
Proposed Easement Expansion Area*
Proposed Fee Expansion Area*
Uplands
Spruce - Fir
Mixed Woods
Northern Hardwoods
Cliff
Wetlands
Fen & Flooded Meadow
Scrub - Shrub Wetland
Wooded Floodplain
Boreal Fen & Bog
Other Conserved Lands
Other Federal Ownership
Private Working Forest with Private Conservation Easement
Private Conservation Owned
Private Working Forest with State Conservation Easement
State Owned
Town Owned Working Forest
* Boundary does not include Great Ponds
Second College Grant
Dixs Grant
Wentworth Location
Erroll
Umbagog Lake
Township C
C Surplus
Upton
Cambridge
Gratton Twp
Andover North Surplus Twp
Andover West Surplus Twp

Our land conservation objectives are the result of a very active regional partnership and fully complement the management on adjacent conserved lands, both public and private. The proposal also complements the original purpose and intent for which the refuge was established. Our expansion proposal, detailed in appendix A, "Land Protection Plan" (LPP), identifies the significance of the refuge expansion in contributing to the current and planned network of conservation lands and wildlife resources in the regional landscape. Working in partnership with these surrounding landowners is critical to its successful implementation. The detailed strategies in the LPP were developed cooperatively with our state fish and wildlife agency partners, and supported by our other land conservation partners working in the Northern Forest region.

Regarding our visitor services programs, alternative B would enhance the existing priority public use opportunities for hunting and fishing by providing better outreach and information materials, and improving access and parking (map 2-8). Opportunities for wildlife viewing, photography, and interpretation would be expanded primarily by providing new infrastructure such as trails and viewing areas. In addition, new roadside pullouts, informational kiosks, and viewing platforms are proposed along the major travel corridors. Further, new visitor infrastructure, including a series of interpretive trails, would be developed in conjunction with the proposed new location for a refuge administrative headquarters and visitor contact facility at the former Potter Farm site. We would also pursue a partner-managed, regional visitor contact facility in the Town of Errol.

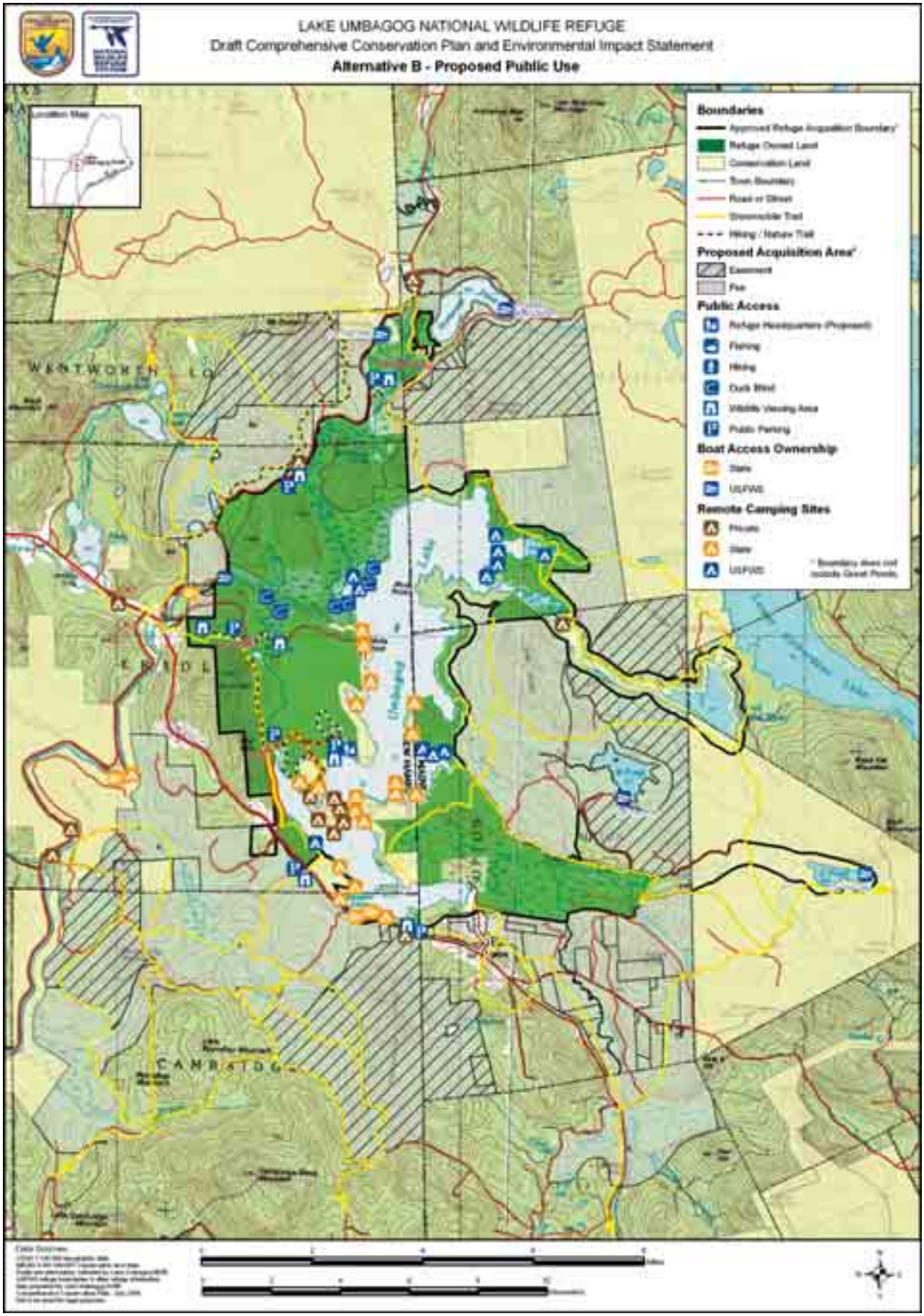
Concerning other refuge uses, we would continue to allow snowmobiling on the existing designated trails. Remote camping on the existing, 12 designated lake sites would also continue to be allowed and managed cooperatively with NH DRED, although we would increase monitoring of individual sites, and rehabilitate or relocate those lake sites in need of restoration. We would eliminate the 2 river sites, and not replace them. We do not plan to increase opportunities for either snowmobiling or camping. We would also plan to open the refuge to furbearer management under permit, consistent with a Furbearer Management Plan.

Fishing on Umbagog Lake

Ian Drew/USFWS

Under alternative B, lands we acquire in the proposed expansion area would be open to long-term public access for compatible, priority public uses such as: hunting, fishing, wildlife observation and photography and environmental education and interpretation. We would maintain open the major road corridors in the expansion lands to facilitate access to these activities.

We would also enhance local community outreach and partnerships, continue to support a Friends Group, and provide valuable volunteer experiences as we implement alternative B. As described under goal 7, we would pursue the establishment of a Land Management and Research Demonstration (LMRD) site on the refuge to promote research, and the development of applied


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
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Alternative B - Proposed Public Use
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Conservation Land
Town Boundary
Road or Street
Snowmobile Trail
Hiking / Nature Trail
Proposed Acquisition Area*
Easement
Fee
Public Access
Refuge Headquarters (Proposed)
Fishing
Hiking
Duck Blind
Wildlife Viewing Area
Public Parking
Boat Access Ownership
State
USFWS
Remote Camping Sites
Private
State
USFWS
* Boundary does not include Grant Ponds.
WENTWORTH
CAMBRIDGE

Goal 1 Manage open water and wetlands to benefit Federal trust species and other species of conservation concern.

Objective 1.1 (Fen and Flooded Meadow)
Manage 670 acres of fen and flooded meadow on Service-owned lands, within the current and expanded Refuge boundaries. Within varying depths of up to 3 feet, provide nesting and brood rearing habitat for American black and ring-necked ducks, pied-billed grebe and other marsh birds, and brood rearing habitat for wood duck and common goldeneye. Also, manage undisturbed staging areas for migrating waterfowl and stopover areas for migrating shorebirds from late August through mid-October.

Rationale
The fen and flooded meadow habitat type encompasses medium fen, cattail marsh, seasonally flooded mixed graminoid meadow, eastern tussock sedge meadow, spikerush shallow emergent marsh, and few-seeded sedge-leatherleaf fen (appendix M). The wetter edges of these natural communities are functioning as "emergent marsh" habitat for waterfowl and other marsh and water birds.

The refuge currently owns, or has approval to acquire, 555 acres of this habitat type. Under the alternative B expansion proposal, we recommend Service acquisition of an additional 132 acres of this habitat type (115 acres in fee; 17 acres in conservation easement). Our management emphasis over the next 15 years would be to identify the habitat attributes most important for sustaining the focal species identified in the objective statement, and enhancing, and/or restoring, those attributes. We describe some of those attributes in the species' discussions below.

Umbagog Lake is identified as one of three waterfowl focus areas in New Hampshire under the NAWMP (Atlantic Coast Joint Venture 2005). The Refuge supports the highest concentrations of nesting black ducks and ring-necked ducks in New Hampshire (USFWS 1991). The black duck is a species of concern in the NAWMP because of the historic decline in their population, with habitat loss an important contributing factor. The regional importance of Umbagog Lake to black duck was one of the reasons the refuge was established. Though black duck populations are stable or increasing, they are listed as highest priority for conservation in BCR14 (Dettmers 2005).

Black duck pairs arrive in Maine by April with the peak hatch from June 1-10. They are quite intolerant of human disturbance even during brood stage; therefore, minimizing human disturbance from late May through June may be important. They are generalists in their nest site selection and locate well-concealed nests on the ground in uplands near beaver flowages, floodplains, alder-lined brooks, and other wetlands. On the refuge, black duck and other waterfowl brood rearing habitat is in the "emergent marsh" around the edges of Leonard Marsh, and Harper's and Sweat Meadows, and the backwaters of the Magalloway and Dead Cambridge rivers. These shallow, permanent fens with abundant emergent vegetation, sedges, floating-leaved plants, pondweeds, and scrub-shrub vegetation rich in invertebrates, are favored brood rearing areas for waterfowl. Ducklings feed mostly on larvae of flies, caddisflies, mayflies, and other insects. Adult ducks eat the seeds of bur reed, sedges, pondweeds, and other aquatic plants as well as insects and other invertebrates (Longcore et al. 2000). In the expansion area, critical waterfowl areas proposed for acquisitions include: the extension of the Magalloway River; Swift-Cambridge River; and, the Mollidgewock Brook.

Ring-necked ducks nest much closer to water than black ducks and are susceptible to water level changes. Therefore, the ring-necked duck may be an

important indicator for the effects of water level fluctuations in Umbagog Lake. They build a nest usually on floating hummocks and islands in dense emergent vegetation, especially *Carex* sedges mixed with other herbaceous or woody plants. These ducks nest May through June, later than black ducks, with peak hatching occurring later in June. This diving duck forages in shallow water usually less than six feet deep. Their primary food sources are seeds and tubers of submerged and emergent plants and some aquatic invertebrates; the young depend entirely on aquatic invertebrates during their first two weeks (Bellrose 1976; Jerry Longcore, U.S. Geological Survey, personal communication, 2004).

The bathymetric study of the lake, proposed under all alternatives, would help determine the effects of water level changes on waterfowl habitat. Water level changes that occur after mid-July would likely not have a significant effect on duck broods. Ducks with broods are not territorial and will keep moving around in the large inter-connected waterways of Umbagog Lake (Jerry Longcore, U.S. Geological Survey, personal communication, 2004).

Umbagog Lake is also an important migratory staging area for the waterfowl mentioned above as well as such species as scaup, scoters, and Canada geese. Many migrating waterfowl feed among the fen and flooded meadows on seeds and tubers of aquatic plants, while other species such as scoters, forage along the rocky shallow water areas of the lake.

Marsh birds using Leonard Marsh, Harper's Meadow, and Chewonki Marsh include common snipe, Virginia rail, American bittern, pied-billed grebe, and sora. The pied-billed grebe is listed as endangered in New Hampshire. The grebe typically builds a floating platform nest over shallow water attached to the stems of emergent vegetation. There is some indication that water depth (>10 inches to enable predator escape and nest construction) and density of emergent vegetation ($\geq$4 in^2 of stem basal area/yd^2) are important criteria and the pied-billed grebe may shift its nesting activity within and between nesting seasons in response to changes in water levels and availability of emergent vegetation cover (Muller and Storer 1999).

Our ability to benefit migratory shorebirds will depend on our ability to work with the holder of the FERC license for the Errol Project (currently FPLE) to affect water level management outside of June and July. Peak shorebird migration times for the Umbagog Lake area are mid-May to early June during spring, and late-August through mid-October for fall migration (Bob Quinn, private consultant, unpublished data, 2004). Shorebirds forage in exposed mudflats. Exposed mudflats occur irregularly in the fall depending on the lake levels, and occur most commonly where the Androscoggin River leaves Umbagog Lake in the Leonard Pond area. Inland freshwater wetlands and mudflats are thought to be particularly important for migrating spotted and solitary sandpipers. The most common shorebirds using the refuge are common snipe, spotted sandpiper, greater yellowlegs, and solitary sandpiper. The North Atlantic Regional Shorebird Plan lists greater yellowlegs as a high conservation priority (Clark and Niles 2000).

Strategies
In addition to objective 1.1 strategies under alternative A:

Within 5 years of CCP approval:

- Design and implement an expanded waterfowl, shorebird, marsh, and wading bird breeding survey program to include migration and brood surveys.

- Evaluate, and implement where appropriate, opportunities to expand wild rice and other vegetative food sources for migratory waterfowl.

- Survey aquatic invertebrate availability during spring and fall migration periods for shorebirds and waterfowl.

- Evaluate isolated backwater areas with high potential for waterfowl brood rearing (e.g. quiet backwaters w/ combination of forest cover, submerged aquatic vegetation, and intermixed emergent wetlands in Dead Cambridge and Upper Magalloway rivers) to determine if seasonal boat access closures would reduce habitat disturbance; implement if beneficial.

Within 5-10 years of CCP approval:

- Determine the water level regime most beneficial to waterfowl at each important stage: breeding, brood rearing, and spring and fall migration.

- Acquire 132 acres of this habitat type within the expansion area, from willing sellers, and manage the fee lands as described in objective 1.1.

Within 10-15 years of CCP approval:

- Evaluate the impacts of various water levels on shorebirds, waterbirds, and marsh birds.

- Initiate discussions with hydropower facility owner/operator to discuss the feasibility of managing water levels voluntarily, within the limits of the FERC license, during waterfowl and shorebird migration periods to improve foraging and staging habitat conditions.

Objective 1.2 (Boreal Fen and Bog)
Manage the 3,739 acres of boreal fen and bog on Service-owned lands, within the current and expanded refuge boundaries, to sustain the health and integrity, and uniqueness of the rare species and natural communities, such as the Floating Island National Natural Landmark, the circumneutral pattern fen, and other peatlands.

Rationale
The boreal fen and bog habitat types encompasses leatherleaf poor fen, medium shrub fen, sub-boreal dwarf-shrub fen, circumneutral pattern fen, black spruce wooded bog, black spruce-larch swamp, and spruce-fir swamp (appendix M). "Peatlands" are another commonly used term to describe some of these plant communities. We recognize these plant communities as important components of the region's native biological diversity and seek to maintain the health of these areas in keeping with the Service's Biological Integrity, Diversity, and Environmental Health policy (601 FW 3).

The refuge currently owns, or has approval to acquire, 1,281 acres of this habitat type. Under the alternative B expansion proposal, we recommend Service acquisition of an additional 2,799 acres (2,458 in fee; 341 in conservation easement). Our management emphasis over the next 15 years would be to complete an inventory of the unique and rare community types, and establish what measures of ecological health and integrity should be monitored over time.

On the western side of Umbagog Lake is a large 870-acre peatland complex encompassing four areas: Leonard Marsh, Sweat Meadow, Harper's Meadow, and Chewonki Marsh. A 750-acre portion of the complex, known as "Floating Island," was designated as a NNL in 1982 (Nazaire 2003). These areas and associated wetlands form one of the largest peatland complexes in New Hampshire and harbor a high diversity of vascular plants, mosses, and liverworts (Dan Sperduto, NHNHB, pers comm.). The peatland complex is impacted by water level fluctuations in Umbagog Lake, although the impacts on community structure and

USFWS

Pitcher plant

species diversity and abundance are unknown (Nazaire 2003). In a study of a similar ecosystem in Sweden, Nilsson and Keddy (1988) found a direct correlation between the duration of flooding and species diversity and abundance, with long flood periods reducing plant diversity and abundance.

A rare fen of high regional significance, the circumneutral-patterned fen, is found near the center of Tidswell Point. Most of this fen is on land owned by the State of New Hampshire as part of the Umbagog State Park, with a portion on the refuge. Only a few locations of this natural community type are known to occur in New England. A large, high quality northern white cedar swamp surrounds the fen (Dan Sperduto, NHNHB, pers comm).

Protecting and sustaining the floating bog, patterned fen, and other unique peatlands on the refuge requires increased efforts to identify and understand the factors that determine the occurrence and persistence of these peatland communities. We plan to monitor and manage the factors that affect the peatlands.

Many birds use peatland habitats for breeding, foraging, during migration, or in winter. These include palm warbler, rusty blackbird, black-backed woodpecker, yellow-rumped warbler, northern water thrush, and swamp sparrow, among others. Mink frog, a host of other amphibians, and a diverse suite of small mammals, including many shrew species and bog lemmings utilize this habitat as well. All of these species would benefit from the refuge's objective of conserving the boreal fen and bog habitat.

Strategies
In addition to objective 1.2 strategies under alternative A:

Within 5 years of CCP approval:

- Conduct a comprehensive inventory of the FINNL to better define criteria for monitoring and managing its diversity and integrity over the long-term.
- Work with the NHNHB and MNAP, and NPS to identify and refine monitoring and management criteria for the FINNL and the other unique wetlands.
- Work closely with State Non-game and Natural Heritage programs to identify and monitor rare species occurrences in this habitat type.
- Establish buffer zones around these sensitive natural communities based on best management practices published by both states; evaluate their effectiveness and appropriateness in protecting these habitats over the long-term.

Within 5-10 years of CCP approval:

- Develop a proposal to NPS to modify the current natural landmark boundary to more accurately encompass the natural system.
- Conduct a detailed assessment to identify rare plants and animals, especially invertebrates, associated with this habitat type.
- Acquire 2,799 acres of this habitat type within the expansion area, from willing sellers, and manage the fee lands as described in objective 1.2

Within 10-15 years of CCP approval:

- Conduct a hydro-geologic study of groundwater and nutrient flow that are maintaining these peatlands. Address issues or threats as necessary.

Objective 1.3 (Northern White Cedar)
Manage 1,031 acres of northern white cedar on Service-owned lands, within the current and expanded refuge boundaries, to sustain the health and diversity of natural and rare ecological communities in the Upper Androscoggin watershed.

Rationale
Northern white cedar habitat encompasses a suite of natural communities, all dominated by northern white cedar (appendix M). Northern white cedar is a boreal species that occurs as far south as Carroll and Grafton Counties in New Hampshire. NHNHB considers northern white cedar swamps a "signature-community" of the north woods and hence an important component of the region's biodiversity (Sperduto and Engstrom 1998). We recognize these plant communities as important components of the region's native biological diversity and seek to maintain the health of these areas in keeping with the Service's Biological Integrity, Diversity, and Environmental Health policy (601 FW 3).

The refuge currently owns, or has approval to acquire, 1,031 acres of this habitat type. Small, scattered stands likely occur within the proposed expansion area, but they are not discernable within the data sets that we used for our vegetation mapping. Should stands be acquired under the alternative B expansion proposal, we would manage them similar to on-refuge stands. Our management emphasis over the next 15 years would be to complete an inventory of this type, and establish what measures of ecological health and integrity should be monitored over time.

The largest (80-100 acres) northern white cedar swamp in New Hampshire surrounds the Whaleback Ponds and extends toward the Magalloway River. This wetland basin is within the refuge acquisition boundary but only a portion is currently under Service ownership (Dan Sperduto, NHNHB, pers comm).

Several northern bird species use this habitat type year-round including boreal chickadee, gray jay, black-backed woodpecker, and spruce grouse. White-tailed deer find cover and forage in northern white cedar stands. Ten species of frogs and toad and 7 species of small mammals are known to occur in this habitat type on the refuge, and will directly benefit from our objective to maintain it.

Strategies
In addition to objective 1.3 strategies under alternative A:

Within 5 years of CCP approval:

- Establish buffer zones to protect these sensitive natural communities using best management practices developed by states; evaluate their effectiveness and appropriateness in protecting this habitat type over the long-term.

- Work closely with State Non-game and Natural Heritage programs to conduct more detailed surveys of rare plant and animal occurrences in, and the overall condition, of these natural communities.

- Ensure that the HMP addresses competition from balsam fir and hardwoods resulting from disturbance or management actions.

Within 5-10 years of CCP approval:

- Evaluate and monitor regeneration of northern white cedar including potential impacts from deer, snowshoe hare, and moose browsing; ensure that the HMP addresses the effects of browsing by these species if relevant.

- Evaluate the habitat requirements of boreal species utilizing this habitat type, such as black backed woodpecker, and if appropriate, manage to enhance habitat components for these species.

- If this habitat type is acquired within the expansion area, from willing sellers, the fee lands would be managed as described in objective 1.3

Within 10-15 years of CCP approval:

- Evaluate land use changes and management actions (e.g., timber harvest) and how they might affect the hydrology of northern white cedar swamps.

- Restore up to 150 acres over 15 years of northern white cedar in areas where past land use practices have converted it to another habitat type; consider winter cutting and other accepted silvicultural practices that would promote cedar stands.

Objective 1.4 (Scrub-Shrub Wetland)
Manage 1,741 acres of scrub-shrub wetland on Service-owned lands, within the current and expanded refuge boundaries, as foraging and brood habitat for American woodcock, and to provide nesting and migratory habitat for birds of conservation concern, such as Canada warbler.

Scrub-shrub wetland on Dead Cambridge River

Bill Zinni/USFWS

Rationale
Scrub-shrub wetland encompasses speckled alder peatland lagg, speckled and/or green alder shrubland, speckled alder swamp, and sweetgale mixed shrub thicket (appendix M). The refuge currently owns, or has approval to acquire, 899 acres of this habitat type. Under the alternative B expansion proposal, we recommend Service acquisition of an additional 906 acres of this habitat type (842 acres in fee; 64 acres in conservation easement). Our management emphasis over the next 15 years would be to identify the habitat attributes most important for sustaining the focal species identified in the objective statement, and creating and/or enhancing those attributes, especially in woodcock focus areas (map 2-2). We describe some of those attributes in the species' discussion below.

The Service developed the *American Woodcock Management Plan* in 1990 to help stem the decline in American woodcock (USFWS 1990). Long-term trends show a decline of –1.3% per year from 1993-2003 and –2.3% per year from 1968-2003 in the eastern United States. Between 2002 and 2003 Maine reported an increase in the breeding population, yet the overall trend in Maine since 1968 is still negative. New Hampshire showed no significant increase from 2002 to 2003, but it is the only eastern region state showing an increase from 1968 to 2003. Recruitment rates (number of immature birds per adult female) in recent years are 18% below the long-term regional average. 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). The 2005 Maine CWCS identifies habitat conservation, and additional surveys and monitoring, as the two highest priorities in the state for conserving woodcock populations (MDIFW 2005).

Functional foraging habitat for woodcock occurs on moist, rich soil dominated by dense shrub cover (75-90%); alder is ideal, although young aspen and birch are also suitable as feeding areas and daytime (diurnal) cover. Woodcock require several different habitat conditions that must be in close proximity to one another. These include clearings for courtship (singing grounds), large openings for night roosting, young second growth hardwoods (15-30 years) for nesting and brood-rearing, and functional foraging areas (Sepik et al. 1981; Keppie and Whiting 1994).

The Canada warbler is declining across much of its range and is listed as highest priority in BCR 14 (Dettmers 2005). PIF has a goal of increasing the Canada warbler continental population by 50% (Rich et al. 2004). It breeds in a range of habitat types including deciduous forested swamps, cool, moist, mature forest or streams and swamps with dense undergrowth, streamside thickets, and cedar bogs (Conway 1999). It nests on or near the ground, generally near water. Suitable habitat often has a layer of moss and an uneven forest floor; however, they may be less common in shrub wetlands (Conway 1999). On the White Mountain National Forest in New Hampshire and Maine they occur in northern hardwoods with a softwood understory (DeGraaf and Yamasaki 2001). In central Maine, Collins (1983) found the Canada warbler in forests with a high percent shrub cover (70%), moderate canopy cover (64%), and minor component of conifers in the canopy. Hagan and Grove (1999) suggest the species is likely adapted to natural tree fall gaps, hence their positive response to forest management that creates dense deciduous understory with some overstory remaining. Canada warbler will also benefit from the proposed management in mixed woods and northern hardwoods (see alternative B, objective 3.1). The 2005 Maine CWCS identifies habitat conservation and research as the two highest priorities in the state for conserving Canada warbler populations (MDIFW 2005).

Other birds that nest in scrub-shrub habitat include swamp and song sparrows, common yellowthroat, yellow warbler, and alder flycatcher.

Beaver can be ecologically important to creating and maintaining scrub-shrub and other wetlands environments that also provide important habitat for woodcock and Canada warbler, other focal species such as black duck and wood duck, and culturally important species such as moose. In some areas, we propose to manage local beaver populations to improve habitat for our focal species. Beaver occupy small to large slowly flowing, wooded streams, rivers, or lakes and rarely occur in fast-moving waters. Howard and Larson (1985) described the best beaver habitat as occurring on relatively wide streams with low gradient on soil with poor drainage. Nearby food sources are also important including the roots and tubers of aquatic vegetation for summer diet and the bark of deciduous trees for fall and winter caching (DeGraaf and Yamasaki 2001). Stream gradients less than 3 percent are optimal, while narrow, steep valleys are less suitable.

Strategies
In addition to objective 1.4 strategies under alternative A:

Within 5 years of CCP approval:

- Develop and implement a plan to improve habitat for nesting and migratory birds of conservation concern, such as Canada warbler.

- Incorporate management strategies into the furbearer management plan; include the possibility of annual closures in some areas, an extended trapping season, and/or transplanting beaver to meet refuge objectives.

Within 5-10 years of CCP approval:

- In woodcock focus areas (map 2-2), develop and implement a plan to manage this habitat in proximity to upland nesting areas. Create and maintain alder in suitable age/size class to maintain quality foraging and brood areas. Alder would be maintained on approximately 20-year rotations.

- Manage beaver densities, within areas identified as suitable and in historical habitat, as a means of maintaining cyclical successional stages of this wetland type.

Within 10-15 years of CCP approval:

- Acquire 906 acres of this cover type within the expansion area, from willing sellers, and manage the fee lands as described in the objective 1.4.

Objective 1.5 (Open Water)

In partnership with the States of Maine and New Hampshire, manage the estimated 5,880 acres of open water on Service-owned lands, within the current and expanded refuge boundaries, to maintain submerged aquatic vegetation (SAV) and native fish such as brook trout, provide loafing and foraging areas for water birds, and to maintain high water quality to benefit other native vertebrate and invertebrate aquatic life.

Rationale

The refuge currently owns, or has approval to acquire, an estimated 5,834 acres of this habitat type. Under the alternative B expansion proposal, we recommend Service acquisition of an additional 69 acres of this habitat type (46 acres in fee; 23 acres in easement). The refuge's open waters encompass the rivers and backwaters, small ponds, and the portion of Umbagog Lake that extends from the current shoreline to the original, pre-1851 shoreline. These open waters provide loafing areas for many birds and harbor important plant and other food resources below the surface. Our management emphasis over the next 15 years will be to inventory and map the extent of SAV and mussel beds, and establish parameters, and implement a program, for monitoring water quality and the effects of water-level fluctuations on resources of concern.

Umbagog Lake has some unique features, perhaps related to its extensive shallow areas. The average depth of the lake is 15 feet. Aside from the Magalloway and Androscoggin rivers, most of Umbagog functions as a lake ecosystem. However, little is known about how the riverine and lake aquatic system functions. The lake has vast mussel beds that extend through much of the lake, at least on the New Hampshire side. The enormous collective filtering capacity of this community may contribute much to the high water clarity of the system. More study is needed to understand how the mussels affect the rest of the Umbagog Lake food web and how water level fluctuations affect the mussels (Jim Haney, University of New Hampshire, personal communication, 2005).

SAV, with their flexible stems and leaves, are rooted in the sediment and completely covered by water. These plants produce oxygen, filter and trap sediments, absorb nutrients, and provide food and shelter for fish and wildlife. Plants such as pondweeds, bulrushes, and wild celery produce seeds and tubers critical to foraging waterfowl. SAVs host many aquatic invertebrates that are, in turn, food for waterfowl and their broods. The distribution of these plants in the lake is affected by water depth, water clarity, and sediment type. SAVs typically occur on muddy or soft sediments rather than on sand or gravel sediments (Stevenson et al. 1979, Krischik et al. 2005). Different water levels on Umbagog Lake affect the extent of ice scouring and freezing of the lake bottom and consequently the distribution of SAVs.

The Magalloway River and Umbagog Lake are important wintering habitat for native brook trout from the Diamond River watershed (Diane Emerson, NHFG, personal communication, 2004) and Rapid River (Boucher 2005). MDIFW is concerned about potential recruitment of smallmouth bass into the Rapid River and the Cambridge River systems and the bass dominating critical habitat and food resources to the detriment of "an extraordinary brook trout resource" (Boucher 2005). Smallmouth bass were illegally introduced into Umbagog Lake around 1985. Prior to this release, the major fishery in the lake was a cold water fishery around the mouth of the Rapid River and warm

water fishery for pickerel and yellow perch. In addition to potential impacts to brook trout, there are indications that the number and behavior of anglers has changed on Umbagog Lake with the arrival of bass. Bass anglers fish more intensively than other anglers and tend to fish in shallower water, close to shore, and spend more time in one spot. The impacts to this increased fishing pressure on loons and other wildlife is unknown (Forrest Bonney, personal communication, 2002). The 2005 Maine CWCS identifies surveys/monitoring and research as the two highest priorities in the state for conserving brook trout populations (MDIFW 2005). In addition, we will work with our state partners to implement the goals and objectives of the Eastern Brook Trout Joint Venture, an interagency partnership which is currently developing a strategic plan.

Strategies
In addition to strategies under "Actions Common to All of the Alternatives" affecting this habitat type:

Within 5 years of CCP approval:
- Map distribution of submerged aquatic vegetation – species, density, and size of beds.
- Map and monitor native mussel beds
- Determine, in cooperation with state partners and the Umbagog Working Group, how best to implement the Eastern Brook Trout Joint Venture goals and objectives in this area

Within 5-10 years of CCP approval:
- Evaluate littoral zone sediments where submerged aquatic vegetation is sparse or non-existent, and re-establish vegetation where appropriate to enhance or improve food resources for waterfowl.
- Monitor water quality, chemistry, and water levels for potential effects on aquatic vegetation, fish, and waterfowl.
- Inventory macro-invertebrates and fisheries resources.
- Evaluate the potential use of, including its impacts, fish barriers to prevent non-native fish species from becoming established in water bodies surrounding Umbagog Lake; namely the Dead Cambridge River corridor.
- Acquire an estimated 69 acres of this habitat within the expansion areas and manage the fee lands as described in objective 1.5

Within 10-15 years of CCP approval:
- Evaluate point and non-point sources of pollution affecting refuge lands and work with State, private and local entities to improve water quality.

Objective 1.6 (Common Loon)
Within 15 years of CCP completion, and cooperating with state partners, conserve and manage common loon territories to support a 5-year annual average of 18 nesting pairs on Umbagog Lake and its tributaries, and 4 additional pairs within the expansion area, and achieve a 5-year average annual productivity of 0.5 chicks per nesting pair. Management activities will be focused in fen and flooded meadow, floodplain and lakeshore, and open water habitats.

Rationale

Umbagog Lake and its associated rivers and backwaters are important breeding areas for the common loon in the Northeastern United States. This refuge is one of only 3 in the Refuge System in the lower 48 states that support breeding common loons. The common loon was also one of the key species specifically identified for conservation at the time of refuge establishment. The BCR 14 plan lists the common loon as a species of moderate conservation concern.

Regional threats to common loon include habitat loss due to shoreline development, water level fluctuations, human disturbance (recreational pressures), environmental contaminants, oil spills, lake acidification, mercury poisoning, and lead poisoning among other threats. The proposed Lowest Observed Adverse Effect Level (LOAEL) for mercury in adult loon blood is 3.0 ug/g (Evers et al. 2004). Because blood mercury levels from adult loons sampled from Umbagog Lake during 1994-2004 have never reached this proposed effect level, mercury does not appear to be a risk factor to adult loons in this system. Lead fishing tackle does pose a significant threat to loons. From 2000-2004, six loon carcasses found on Umbagog Lake were submitted to Tufts University School of Veterinary Medicine to determine the cause of death. All six (100%) were attributed to lead poisoning (Mark Pokras, Tufts University, unpublished data).

The Service and cooperating partners monitor and manage activities on Umbagog Lake to benefit loons. They work annually with the holder of the FERC license for the Errol Project, who manages water levels, and by closing nesting areas, and installing educational signs. In spite of these management activities, the LPC reported that the Umbagog Lake loon population declined from 31 territorial pairs in 2000 to 15 territorial pairs in 2002 (Taylor and Rubin 2002).

The majority of loon nests on Umbagog Lake are established from mid-May to mid-June with hatching dates from mid-June to late July. Nest site selection is often opportunistic with loons using island and mainland marshes, muskrat feeding mounds, floating bogs, and logs. Loons also readily accept floating platforms (McIntyre and Barr 1997). Common loons are strongly territorial and the territory size they will defend is highly variable depending on lake size, suitable nesting sites and land features that provide privacy from other pairs (Lang and Lynch 1996). Umbagog Lake's large size and prevalence of coves and islands offers many potentially suitable territories for common loons.

Common loons and chick on the Magalloway River

Ian Drew/USFWS

Using summary data from LPC reports from 1991 to 2005, the number of nesting pairs were analyzed in 5 year intervals to develop a target number of nesting pairs of common loons. From 1991-1995, the average number of nesting pairs was 17.4 $\pm$ 3.44, from 1996-2000, the number was 18.4 $\pm$ 2.30 and from 2001-2005, the number was 14.0 $\pm$ 2.92. Since the most recent 5 year average represents an apparent decline in nesting common loons, the refuge and cooperating partners will work toward increasing the number of nesting pairs back to the approximate average of 18 reported from 1991-2000. The refuge and cooperating partners will also work toward increasing production of those 18 pairs to an average of 0.5 chicks per pair based on the rate of 0.48 chicks fledged per pair for a self-sustaining population (Evers 2004). This objective

is not intended to maximize the number of common loons in the area, but to achieve a level which reduces negative interactions between common loons and between common loons and other waterfowl. The four additional pairs within the expansion area include territories on: 1) Sturtevant Pond, 2) B Pond, 3) C Pond and 4) Pond in the River.

Strategies
In addition to objective 1.5 strategies under alternative A:

Within 5 years of CCP approval:
- As studies are completed on Umbagog Lake, validate the loon nesting and territorial carrying capacities, and further determine whether 18 nesting pairs on the lake, and 4 nesting pairs in the expansion area, remain appropriate targets for these areas.

Within 5-10 years of CCP approval:
- Monitor angler use. and map locations of fishing pressure and other recreational users, in relation to common loon territories and other breeding wildlife

- Develop and implement a study to evaluate interactions of loon with waterfowl during the breeding season; specifically, evaluate how waterfowl interact at high loon densities.

- Evaluate the need for predator control around common loon sites; consider predator control measures targeted at individual animals

- Evaluate the availability and quality of natural nesting habitat for common loon.

Goal 2 Manage floodplain and lakeshore habitats to benefit Federal trust species and other species of conservation concern.

Objective 2.1 (Wooded Floodplain)
Manage 1,416 acres of wooded floodplain on Service-owned lands, within the current and expanded refuge boundaries, to provide habitat for nesting cavity-dependent waterfowl and other priority bird species of regional conservation concern, including northern parula and rusty blackbird. In addition, manage perching areas for bald eagle, and brood foraging areas for American black duck and other waterfowl. Also, where this habitat type overlays woodcock focus areas, manage for feeding and nesting American woodcock.

Rationale
Wooded floodplain habitat on the refuge includes the following National Vegetation Classification System (NVCS) associations: red maple floodplain forest, red maple-balsam fir floodplain forest, white spruce-balsam fir berm woodland, red maple-tussock sedge floodplain woodland, black ash-mixed hardwoods swamp, and red maple-black ash swamp (appendix M). This habitat type, which constitutes 5% of refuge acres, contributes significantly to the wildlife diversity known on the refuge. For example, we have detected over 75 bird species from point locations in this habitat type during our breeding bird surveys.

The Magalloway River floodplain, ranked as an S2 (imperiled) community by NHNHB, and approximately 245 acres in size, offers quality habitat for waterfowl, providing the combination of large cavity nesting trees and river

bottomland areas with submerged and floating leaf aquatic plants and abundant substrate for invertebrates. Common goldeneye, wood duck, and hooded and common mergansers nest in cavities in live trees with a diameter at breast height (d.b.h.) of 18 inches or more (Tubbs et al. 1986).

The rusty blackbird, a watchlist species for BCR 14 and PIF 28 bird conservation planning areas, nests in riparian areas, boreal wooded wetlands, and beaver flowages (DeGraaf and Yamasaki 2001; Rich et al. 2004). According to the species profile in the 2005 NH WAP, this species has declined dramatically; BBS results from 1996-2001 indicate a 10.7% decline (NHFG 2005).

We have documented rusty blackbird breeding in the Magalloway River floodplain. It builds a nest near streams, ponds, bogs, and fens, usually less than 10 feet above the ground in thick foliage near the trunk of a young spruce or fir or in a shrub thicket. It will also utilize the spruce-fir and mixed woods habitat types between 1000 ft to 4,000 ft in elevation in refuge uplands. During migration rusty blackbirds congregate in flocks in wooded swamps (DeGraaf and Yamasaki 2001) and migrating flocks are documented for Umbagog Lake (Brewster 1937), although they may be less common now (Richards 1994). The rusty blackbird shows some aversion to clearcutting that creates suitable habitat for competitors including red-winged blackbird and common grackle (Dettmers 2005). Some disturbance (e.g., windthrow, beaver activity) creates forest openings allowing regeneration of softwoods and resulting in potential rusty blackbird nesting habitat (Avery 1995). The New Hampshire WAP identifies the use of pesticides on the breeding and wintering grounds, destruction of wintering habitat, acidification of water bodies on the breeding grounds and efforts to control blackbirds on winter roosts may be the contributing to the decline of this bird.

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)* that they use in nest building. There are indications that the northern parula population decline is related to the decline of *Usnea*, a lichen sensitive to air pollution (DeGraaf and Yamasaki 2001). PIF considers the northern parula a moderate priority for BCR 14, although the region supports 23% of the population (Dettmers 2005). The northern parula is rarely in deep woods, but also avoids clear cuts and may be sensitive to forest fragmentation (DeGraaf and Yamasaki 2001). It may require at least 250 acres to sustain a breeding population (Robbins et. al. 1989). The 2005 Maine CWCS identifies habitat conservation and research as the two highest priorities in the state for conserving rusty blackbird and northern parula populations (MDIFW 2005).

Through managing this habitat type, and the vernal pools embedded within it, other native species will benefit including a rich diversity of amphibians such as mink frog, spotted and blue-spotted salamanders, and wood frog. In addition, sustaining this habitat would benefit several bats including little brown, hoary, and northern long-eared that roost in tree cavities, under loose bark, or under dense foliage.

The refuge currently owns, or has approval to acquire, 1,293 acres of this habitat type. Under the alternative B expansion proposal, we recommend Service acquisition of an additional 136 acres of this habitat type (123 acres in fee; 13 acres in easement). Our management emphasis over the next 15 years would be to identify the habitat attributes most important for sustaining the focal species identified in the objective statement, and enhancing, and/or restoring, those attributes. We describe some of those attributes in the species' discussions below. We would manage this habitat type on current refuge lands within the habitat management units we have identified in appendix K.

Given our habitat management and land acquisition proposals under alternative B, we estimate refuge fee lands could provide high quality breeding habitat to support 115 pair of northern parula (based on an estimated density of 12.35 ac/pair), and 58 pair of rusty blackbird (based on an estimated density of 24.71 ac/pair), thus contributing directly to the BCR 14 goals for both of these species of conservation concern (Randy Dettmers, personal communication, 2006).

Strategies
In addition to objective 2.1 strategies under alternative A:

Within 5 years of CCP approval:

- Develop and implement a plan to improve habitat for nesting and migrating birds of conservation concern, such as northern parula and rusty blackbird.
- Conduct breeding bird surveys for northern parula and rusty blackbird following Regional Service protocol.
- Retain the majority of trees with cavities, standing dead trees, downed logs, large trees, and large super-canopy trees in the riparian areas.
- In woodcock focus areas, develop prescriptions to enhance habitat type for this species.

Within 5-10 years of CCP approval:

- Manage lowland hardwood and alder to provide adequate food resources for beaver to promote a natural cyclical succession of this habitat type driven by beaver.
- Develop and implement a furbearer management plan to maintain beaver presence where they are important to sustain this habitat type. Utilize the New Hampshire and Maine beaver trapping regulations as appropriate on refuge lands. Also, include the possibility of annual closures in some areas, an extended trapping season, and/or transplanting beaver.
- Map and monitor the rare floodplain forest type that occurs along the Magalloway River.
- Acquire 136 acres of this cover type within the expansion area, from willing sellers, and manage the fee lands as described in the objective 2.1.
- Evaluate isolated backwater areas with high potential for waterfowl brood rearing (e.g. quiet backwaters with the combination of forest cover, submerged aquatic vegetation, and intermixed emergent wetlands in Dead Cambridge and Upper Magalloway Rivers) to determine if seasonal boat access closures to reduce disturbance; implement closures if beneficial.

Within 10-15 years of CCP approval:

- Maintain, enhance and/or create cavity trees within a range of diameter classes in close proximity to water to provide roosting and nesting areas. Maintain suitable habitat between snags and feeding areas.
- Restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas.
- Evaluate the dynamics and succession of the red maple/black ash type and relate its importance to focal species. If warranted, restore and maintain it to sites where site capability is high for this type and it is part of the predicted potential natural vegetation.

Objective 2.2 (Lakeshore Pine-Hemlock)
Maintain 520 acres of lakeshore pine-hemlock on Service-owned lands, within the current and expanded refuge boundaries, to provide nesting and migrating habitat for birds of conservation concern; to sustain the vegetation diversity within this type, such as the jack pine component; to maintain nesting habitat for bald eagle, osprey, and other raptors; to protect water quality; and, to maintain the scenic and aesthetic values of the Umbagog Lake and other lake shorelines.

Rationale
The lakeshore pine-hemlock habitat type is comprised of the following NVCS associations: hemlock mesic forest, hemlock-hardwoods forest, hemlock-white pine-red spruce forest, red pine-white pine forest, and jack pine/blueberry/feathermoss forest (appendix M).

The refuge currently owns, or has approval to acquire, 520 acres of this habitat type. Small stands likely occur in the proposed expansion area, but they were not discernable in the data set we used to map vegetation. Should stands be acquired in fee under the alternative B expansion proposal, they would be managed similarly. Our management emphasis over the next 15 years would be to protect and sustain existing and potential nest stands and perch trees for bald eagle and osprey, and to inventory and monitor the jack pine stands to serve as a basis for future management.

On the refuge, bald eagle and osprey often nest in large supercanopy trees (large white pines that stick up above the other canopy trees), or in tall snags in this habitat type. Additional information on bald eagles and osprey is discussed under objective 2.3. Jack pine communities are rare in New Hampshire and Maine and the stands around Umbagog Lake are the only low-elevation occurrences in New Hampshire (Publicover et al. 1997). The jack pine stands at Umbagog Lake are scattered along the rocky eastern shore and islands of the lake.

Through managing this habitat type, other native species will benefit, including nesting merlin and sharp-shinned hawk, olive-sided flycatcher, veery, and yellow-bellied sapsucker, among many other common species.

Strategies
In addition to objective 2.2 strategies under alternative A:

Within 5 years of CCP approval:
- Develop and implement a HMP to perpetuate this habitat type, giving priority to water quality protection and aesthetic values
- Maintain large diameter trees for raptor perch trees and future nest trees (also see objective 2.3 immediately below)
- Ensure the HMP addresses recruitment of super-canopy pines.

Within 5-10 years of CCP approval:
- Work with NGO's and States to increase monitoring and protection of raptors, and if feasible, implement cooperative procedures to protect merlin and other forest dependent raptors of conservation concern.

Within 10-15 years of CCP approval:
- Where jack pine occurs, map and monitor this type, and consult with state heritage program and other regional ecologists to determine if special management is warranted to sustain this rare ecological community in the Upper Androscoggin watershed; amend HMP to include management prescriptions.

Objective 2.3 (Bald Eagle and Osprey)
Maintain habitat within one mile of high quality bald eagle foraging habitat to support 2-3 nesting pairs of bald eagle with a minimum annual 1.0 chick/pair productivity level over a 5 year average. Given this bald eagle density, and recognizing inter-specific competition, maintain habitat to support 15 nesting pair of osprey, with a minimum annual 1.0 chick/pair productivity level over a 5 year average.

Rationale
The protection of these two species was a primary reason the refuge was established, and they have been a management priority since then. As such, we believe their management warrants special consideration in a separate objective statement.

Bald eagle
The bald eagle is listed as a threatened species under the Federal ESA and is listed as endangered in New Hampshire and threatened in Maine. In New Hampshire and Maine, bald eagles are found along major rivers and lakes or near the coast in relatively undisturbed forest patches. Bald eagles perch on, nest in, and hunt from tall, coniferous and deciduous trees or snags near water. In the Northeast, white pine is the most common nest tree. Nests are usually within 250 feet of open water near quality foraging areas.

Fish are the preferred food source, although eagles also take waterfowl, aquatic mammals, and scavenge for food. Eagles fish mostly in shallow, low-velocity waters. Chain pickerel, brown bullhead, suckers, white perch, and yellow perch are typical prey in interior Maine (Charles Todd, MDIFW, unpublished report).

In winter, some individuals may leave the breeding areas and congregate in areas with large expanses of unfrozen, open water. A forest stand that offers thermal protection from inclement winter weather is needed for communal night roosting. Night roosts are most often found near foraging areas, but may be further away if the roost is more protected. Umbagog Lake does not support a winter roost site, although some eagles remain in the area (along the Androscoggin River) and scavenge on the lake.

Bald eagle

USFWS

The main goal of the *Northern States Bald Eagle Recovery Plan* (USFWS 1983) is to reestablish self-sustaining populations of bald eagles throughout the northern states region. The initial recovery plan objective is to have 1,200 occupied breeding areas distributed over a minimum of 16 states with an average annual productivity of at least 1.0 young per occupied nest. From 1994-2002 the Leonard Pond nest on Umbagog Lake produced an average of 0.89 chicks/year. A second nest, near Tidswell Point, has produced 1.5 chicks/year from 2000-2005. Umbagog Lake is at the headwaters of the Androscoggin River, and as such, the eagles on the lake are an extension of the Maine eagle population.

Charlie Todd (MDIFW, personal communication, 2005) determined that Umbagog Lake has the potential to support two to three pairs of bald eagles given the separation distance that eagles typically establish from one another. Todd (2005) evaluated several large live white pines near the dead nest tree in Leonard Pond

to determine the potential for alternative nest sites in the area. Alternative nesting trees appear to be available to the eagles should they decide to use an alternative site.

Osprey
The Upper Androscoggin River watershed is an important breeding area for osprey. At the core of this area, Umbagog Lake and its associated rivers and backwaters, was the only part of New Hampshire that maintained a breeding population of osprey through the region-wide decline from the 1950s through the 1970s (NHFG 2005). Osprey are listed by the State of New Hampshire as a threatened species. Regional threats to osprey include predation, shoreline development, human disturbance, electrocution, mercury, lead shot and sinkers, non-point source pollution (contaminants), and wetland loss (NHFG 2005). Osprey populations have experienced strong recoveries on the statewide scale since the early 1980s (Martin et. al. 2006).

Osprey nesting in the U.S. will winter in the Caribbean, Central America, and South America (Henry and VanVelzen 1972; Environment Canada 2001). Osprey breeding on the east coast of the U.S. will winter primarily in northern South America and sometimes in Cuba and Florida (Martel et. al. 2001). Female osprey generally winter farther south than males and individuals of both sexes show strong fidelity to wintering and breeding sites (NHFG 2005).

In northern New England, osprey will typically establish breeding territories near large lakes, major rivers, and coastal estuaries. A habitat model developed for the Gulf of Maine watershed (USFWS 2000) found that 90% of 200 osprey nests were located within 0.6 miles of major rivers or lakes greater than 100 acres in size. Osprey generally require areas with dependable fishing sources within 2 to 3 miles, standing trees or other suitable structures located in wetlands, and an ice-free period of no less than 20 weeks (NHFG 2005). Ospreys nest atop a variety of structures including natural snags and artificial poles in or near water with good visibility (DeGraaf and Yamasaki 2001).

Over the past 25 years, the ASNH, through a contract with NHFG, has monitored nesting attempts, and also began augmenting nesting sites with artificial nesting structures around the lake in 1977 (NHFG 2005). In 2005, through a contract with the refuge, ASNH and the Biodiversity Research Institute (BRI) conducted aerial surveys for osprey in addition to the ground surveys used from 1996 to 2004. A similar method of aerial surveys had been used by ASNH from the mid-1980's to 1996 when they were discontinued due to a lack of aircraft and qualified pilots. Seven new nests were discovered (5 in New Hampshire, 2 in Maine) and field observations were conducted on 26 osprey nests in the study area. The 2005 survey data estimated 17 territorial pairs of osprey, with 14 of those pairs actively engaged in nesting and 12 of the 14 nesting pairs successfully fledged a total of 18 young (Martin, et. al. 2006). ASNH has found osprey numbers to be variable over time. A 40% annual rate of increase (from 3 to 21 nests) was observed from 1980-1995 followed by an 8% annual decrease from 1995 to 2004 (from 21 to 6 nests). The 14 nests discovered in 2005 more than doubles the number of active nests found in 2004 (Martin et. al. 2006).

Charlie Todd (MDIFW, personal communication, 2005) suggested a link between an increasing bald eagle population and declining osprey numbers as a result of increased competition and territoriality. He has observed that bald eagles will appear in an area with many ospreys; with time the osprey may decline and eventually there are osprey areas and eagle areas with no overlap. Bald eagle population recovery has been reported to displace osprey pairs to less optimal nesting areas that are further from preferred foraging areas (Ewins 1997).

Strategies
In addition to objective 2.3 strategies under alternative A, and objective 2.2 strategies immediately above:

Within 5 years of CCP approval:
- Protect and maintain super-canopy trees within 1 mile of high quality foraging habitat to support nesting and perching by bald eagles and osprey.
- Protect individual nest trees with at least a 600-foot buffer area.
- Continue to protect active bald eagle and osprey nests from predators and human disturbance using outreach and visitor contact, buoy lines, restricted access, predator guards and other tools as warranted.
- Protect historic nest sites, nest trees, and partially constructed nest trees.

Within 5-10 years of CCP approval:
- Manipulate pines in high quality raptor habitat areas to promote new nesting sites.
- Develop and implement outreach methods designed to minimize discarded fishing tackle and lines.

Within 10-15 years of CCP approval:
- Ensure recruitment of new nest trees; identify stands with potential.

Goal 3 Manage upland forest habitats, consistent with site capability, to benefit Federal trust species and other species of conservation concern

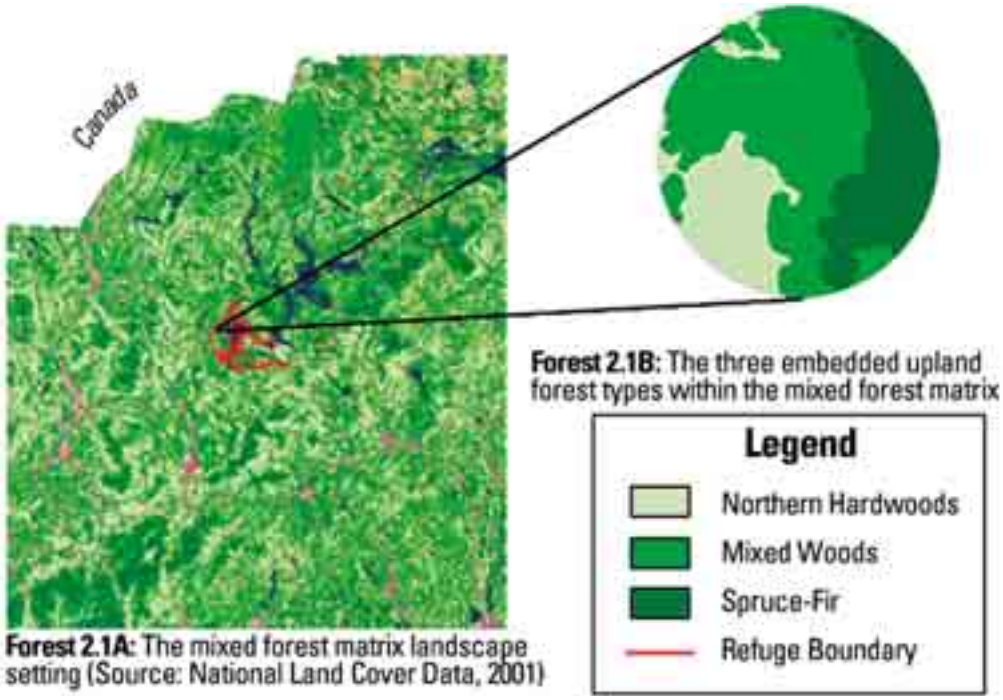
Chan Robbins/USGS

Black-throated green warbler

Objective 3.1 (Mixed Spruce-Fir/Northern Hardwood Forest)
Conserve the mixed spruce-fir/northern hardwood forest on Service-owned lands within the current and expanded refuge boundaries, to sustain well-distributed, high quality nesting and foraging habitat for species of conservation concern, including blackburnian, black-throated green, and Canada warblers, and American woodcock. Also, where consistent with management for those refuge focal species, protect critical deer wintering areas and provide connectivity of habitat types for wide-ranging mammals.

Rationale
As we mentioned under goal 3, alternative A, we define the "mixed spruce-fir/northern hardwood forest matrix" as the most extensive, most connected, and most influential landscape type across the Upper Androscoggin River Watershed basin. Knowing the mixed forest matrix is important because it can influence ecological processes that may affect biodiversity, including the amount and distribution of wildlife species. Others have also defined the mixed spruce-fir/northern hardwood forest as the past, current, and potential future dominant landscape type in the Upper Androscoggin River Watershed basin (Kuchler 1964; Charlie Cogbill, personal communication, 2004). Embedded in the mixed forest matrix landscape, we also define three dominant habitat types: spruce-fir; conifer-hardwood mixed woods; and, northern hardwood (see figure 2.1A and 2.1B). Each of these individual habitat types is found in varying amounts on the refuge and in the surrounding landscape. We have developed separate sub-objectives for each type as outlined below.

According to Cogbill, during the last 150 years, the mixed forest included more conifer than occurs today, particularly in the lowlands, and contained little aspen or white pine. This is also consistent with Kuchler's potential natural vegetation



Forest 2.1B: The three embedded upland forest types within the mixed forest matrix

Forest 2.1A: The mixed forest matrix landscape setting (Source: National Land Cover Data, 2001)

types, and our analysis of the site capabilities on refuge lands (Kuchler 1964). Site capabilities were interpreted from ecological land units (ELUs), a combination of elevation, bedrock geology, and topography, which are three physical characteristics that strongly influence what types of plant communities may be found there (Anderson 1999).

In the Partners in Flight (PIF) Eastern Spruce-Hardwood Physiographic Area 28 Plan, the mixed forest is identified as a high priority habitat that is critical for "long-term planning to conserve regionally important bird populations" (Rosenberg and Hodgman 2000). Our breeding bird survey data shows the elevated importance of the refuge's mixed forest matrix for blackburnian, Canada, and black-throated green warblers in the area. We have selected these, and the American woodcock, as our refuge focal species for management. These species habitat requirements are described below.

The selection of our focal species resulted from a landscape analysis described in appendix N. It was after this analysis our planning team determined that sustaining a mature mixed forest, with a high conifer component and high structural diversity, was the most important ecological contribution the refuge could make through management to the Upper Androscoggin River watershed, the Northern Forest, and the Refuge System. As such, after goal 1, this goal would be the next highest habitat management priority under alternative B. To accomplish this, we would manage our forest to achieve a mix of regeneration, mid-, and mature age classes, and retain snags and other wildlife trees, downed wood and super-canopy trees. We would primarily use uneven-aged management techniques to convert the existing, predominantly even-aged forest stands to a multi-aged, multi-structured condition. Even-aged management techniques may also be used in certain stands, such as those with healthy, advanced regeneration of spruce and fir, woodcock focus areas, or in deer wintering areas. Appendix K provides important details on how we plan to manage our forests. It includes additional information, supplementing what is provided below.

The 15 year scope of our CCP falls far short of the decades used to measure tree growth and stand development in the mixed forest. This objective requires consideration of a much longer timeframe within which to measure and achieve results. As such, our expectation is that it would take at least 100 years to accomplish this objective. This timeframe is based on our prediction of how long it would take to achieve the forest and stand composition and structural characteristics targeted for our refuge focal species identified in the objective statement.

Our habitat type classifications are based on grouped National Vegetation Classification System (NVCS) "associations." A cross-walk between refuge forest habitat types, NVCS associations, Society of American Forester types, and other vegetation classification systems is included in appendix M.

General Strategies (also see strategies for the three specific habitat types in sub-objectives below)
In addition to alternative A:

Within 5 years of CCP approval:

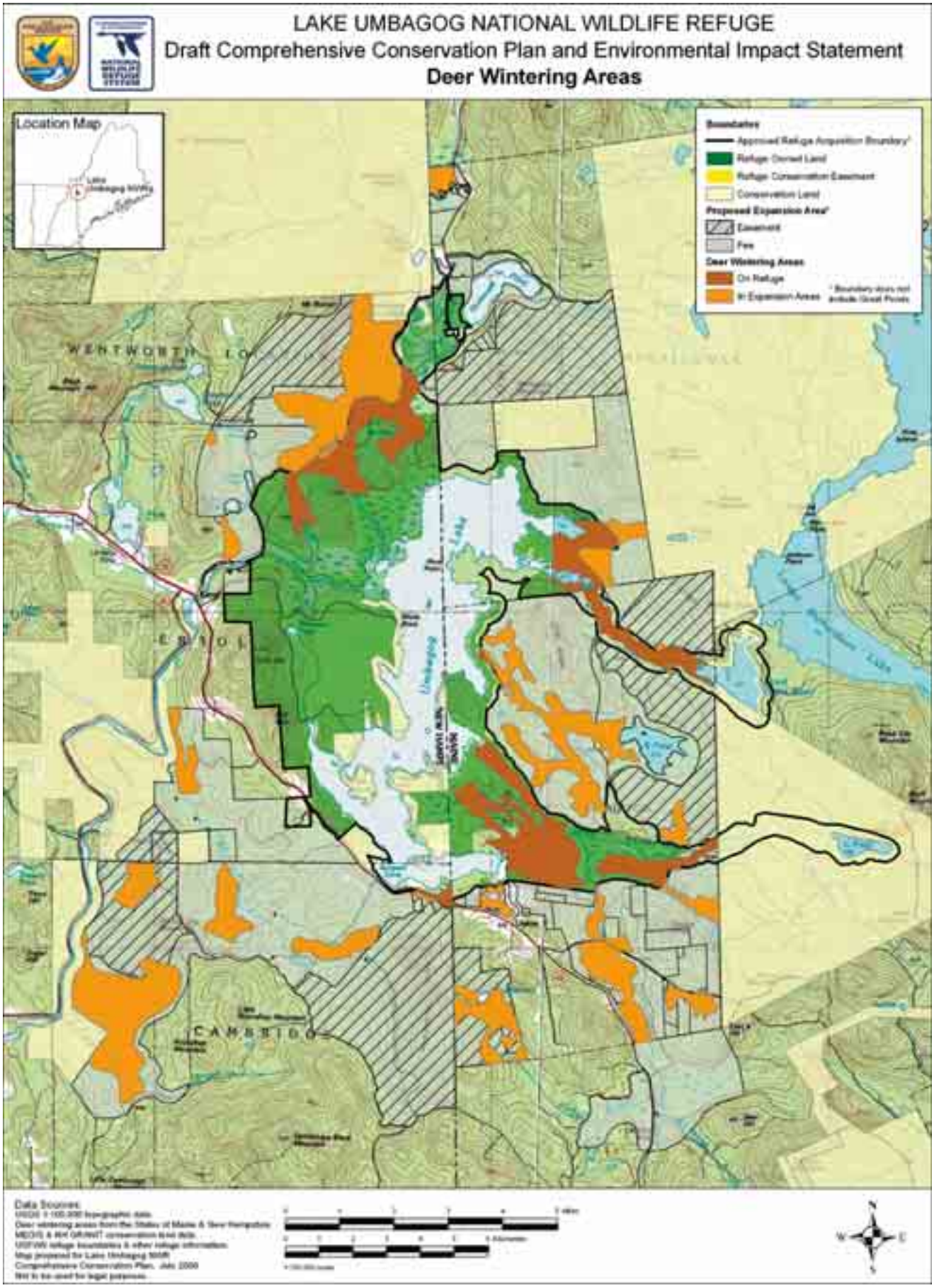
- Conduct breeding bird surveys according to regional Service protocols to track breeding bird trends on the refuge.
- Conduct a detailed inventory in each of the three habitat types to identify or refine specific silvicultural prescriptions.
- Conduct resource surveys prior to forest management to ensure that resources of concern are identified and impacts minimized or eliminated
- Perpetuate, through accepted silvicultural practices, the three habitat types through time, distributed within the refuge based on site capability and our ability to access and manage them.

Within 5 -10 years of CCP approval:

- Acquire up to 28,575 acres of upland forest within the expansion area in fee simple, and 17,080 acres in conservation easements, from willing sellers, and manage as described in objective 3.1.

Sub-Objective 3.1a (Spruce-Fir Habitat Type)
Manage the refuge's 19,770 acres (approximately) of spruce-fir to:

- Sustain singing, nesting and feeding habitat for blackburnian and black-throated green warblers (refuge focal species) by perpetuating a high (>70%) crown closure, favoring spruce during stand improvement, and maintaining super canopy trees
- Maintain at least 50% of deer wintering areas (map 2-9) as quality shelter at any given time, consistent with management of our focal species
- Provide connectivity of forested habitat types for wide-ranging mammals, consistent with management for our focal species
- Provide other structural characteristics to improve stand diversity for other native wildlife species dependent on this habitat type. This will include retention of approximately 6 live cavity trees or snags/acre, with at least 1 of these exceeding 18 inches/dbh, and 3 others exceeding 12 inches dbh, and retaining coarse woody debris and super dominant or super canopy trees.


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Deer Wintering Areas
Location Map
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Refuge Conservation Easement
Conservation Land
Proposed Expansion Area*
Easement
Fee
Deer Wintering Areas
On Refuge
In Expansion Areas
* Boundary does not include Great Ponds
WENTWORTH
ERROL
CAMBRIDGE
Umbagog
Lake
Data Sources:
Map prepared for Lake Umbagog NWR
Comprehensive Conservation Plan, July 2000
Not to be used for legal purposes.

The spruce-fir habitat type includes both high and low elevation spruce-fir. It is comprised of the following NVCS associations: lowland spruce-fir community, red spruce rocky summit, and a black spruce-red spruce community. It is an important ecological component of the diversity of the Upper Androscoggin River Watershed and supports many species of conservation concern.

The 1995 New Hampshire Forest Resources Plan describes the spruce-fir habitat type as supporting more rare animal species than other major habitat types and considers mature spruce-fir a rare habitat type (New Hampshire Division of Forests and Lands 1995).

While we believe this habitat type was much more dominant historically in the mixed forest matrix than we see on the landscape today, its extent in New Hampshire and Maine has been affected by natural disturbances such as spruce budworm and bark beetle outbreaks, and from human disturbances, primarily logging. The 2005 New Hampshire Wildlife Action Plan (WAP) identifies development, timber harvest, non-point pollution, and altered natural disturbance regimes as the most challenging issues currently facing the conservation of this habitat type (NHFG 2005).

Specific Strategies for the Spruce-fir Habitat Type (see appendix K for additional details)

- Improve habitat structural diversity for refuge focal species through pre-commercial and commercial thinning and/or other stand improvement operations. We will favor spruce during all stand improvements.

- Regenerate this habitat type through accepted silvicultural practices. Methods include, but are not limited to:

  1) Utilize primarily single tree or group selection uneven-aged management techniques, and to a lesser extent, clearcutting, or shelterwood even-aged techniques, 2) treatments should be timed to optimize the ability of the site to regenerate spruce and other conifer, 3) target age class goals under management will range from 100-130 years; and, 4) the size of each treatment action and cutting interval will be determined by management unit size, silvicultural prescription, and rotation age.

- In critical deer wintering areas (map 2-9), maintain updated maps of critical areas and manage these stands, to the extent compatible with management of Federal trust resources, to ensure long-term continuation of this habitat. The overall target would be to maintain a minimum of 50% of a deer wintering area as quality shelter at any point in time. Quality shelter includes softwood cover over 35 feet tall and 70% or higher crown closure (Reay et al. 1990). Refuge staff will assist state agencies with ground surveys of wintering deer areas on refuge lands.

Sub-Objective 3.1b (Conifer-Hardwood "Mixed Woods" Habitat Type)

Manage the 12,252 acres (approximately) of conifer-hardwood mixed woods with a high conifer component to:

- Sustain singing, nesting and feeding habitat for blackburnian and black-throated green warblers (refuge focal species) by perpetuating a high (>70%) crown closure, favoring spruce during stand improvement, and maintaining super canopy trees. Enhance foraging habitat for the black-throated green warbler and other native species dependent on this habitat type by developing small gaps to promote a diverse, layered understory. We will favor conifers wherever possible based on site capability.

- Provide connectivity of forested habitat types for wide-ranging mammals, consistent with management for our refuge focal species.

- Provide other structural characteristics to improve stand diversity for other native wildlife species dependent on this habitat type. This will include retention of approximately 6 live cavity trees or snags/acre, with at least 1 of these exceeding 18 inches/dbh, and 3 others exceeding 12 inches dbh, and retaining coarse woody debris and super dominant trees.

The conifer-hardwood mixed woods habitat type is comprised of the following NVCS associations: aspen-fir woodland, successional spruce-fir forest, and red spruce-hardwood forest. We believe the conifer component within this habitat type was much greater over the last 150 years than it is today, due to the past 20 years of logging practices. The New Hampshire WAP identifies development and acid-deposition as the most challenging issues facing this habitat type (NHFG 2005). The 2005 Maine CWCS identifies large-scale forestry operations that result in habitat fragmentation, change in over- and under-story species composition (stand conversion), reduction in rotation length, and loss through development as major threats to this habitat type (MDIFW 2005a).

Specific Strategies for the Mixed Woods Habitat Type (see appendix K for additional details)

- Improve habitat structure for refuge focal species through pre-commercial and commercial thinning and/or other stand improvement operations. We will favor spruce during all stand improvements.

- Regenerate this habitat type through accepted silvicultural practices. Favor conifer on appropriate sites. Methods include, but are not limited to:

Mixed woods on the refuge

Ian Drew/USFWS

On conifer dominated sites -
1) Utilize primarily single tree or group selection uneven-aged management techniques, and to a lesser extent, clearcutting, or shelterwood even-aged techniques, 2) treatments should be timed to optimize the ability of the site to regenerate spruce and other conifer, 3) target age class goals under management will range from 100-130 years; 4) the size of each treatment action and cutting interval will be determined by management unit size, silvicultural prescription, and rotation age. 5) in areas of advanced, healthy conifer regeneration, we will implement silvicultural techniques to protect it.

On hardwood dominated sites -
1) utilize small group selection with up to 1/5 to 1/2 acre group sizes, 2) target age class goals under management are 100-200 years, and 3) cutting cycles will be 15 to 20 years in order to maintain understory development.

Sub-Objective 3.1c (Northern Hardwood Habitat Type)
Manage the 10,427 acres (approximately) of northern hardwood habitat type on those sites optimally suited for hardwood growth to:

- Provide foraging habitat for blackburnian and black-throated green warblers (refuge focal species) by developing multi-aged stands and a mid- to high canopy closure

- Sustain breeding, nesting and foraging habitat for Canada warblers, a refuge focal species, by developing openings, a diverse, layered understory, and promoting the aspen and birch community. This management would also benefit American woodcock (see discussion below)

- Provide other structural characteristics to improve stand diversity for other native wildlife species dependent on this habitat type. This will include retention of approximately 6 live cavity trees or snags/acre, with at least 1 of these exceeding 18 inches/dbh, and 3 others exceeding 12 inches dbh, and retaining coarse woody debris, and super dominant trees. Where possible, we will maintain and encourage the development of mast producing trees (e.g. black cherry, mountain ash, beech).

The northern hardwood habitat type is comprised of the following NVCS associations: red maple-yellow birch early successional woodland, northern hardwood forest, semi-rich northern hardwood forest, and paper birch talus woodland. This habitat type is more extensive on the landscape today than probably occurred over the last 150 years (Charlie Cogbill, personal communication, 2004). Similar to the spruce-fir type, its distribution is largely due to site capability and land-use changes over time. It is also an important ecological component of the diversity of the Upper Androscoggin River watershed.

The northern hardwood habitat type is a deciduous forest dominated by sugar maple, yellow birch and American beech on well-drained soils on mid-elevation slopes. American beech becomes more common in older stands. Most of the area covered by this community was logged at some time in the past (Rapp 2003). Aspen-birch is another forest component of this habitat type, although it can also be a temporary, early successional feature of any of the three broad upland habitat types on the refuge. White birch, quaking and bigtooth aspen, and pin cherry can dominate an area following a large disturbance such as fire or clearcut; however, these shade intolerant species are eventually replaced with more shade tolerant species characteristic of the particular site conditions.

Specific Strategies for the Northern Hardwood Habitat Type (see appendix K for additional details)

- Improve habitat structure for refuge focal species through pre-commercial and commercial thinning and/or other stand improvement operations.

- Regenerate these habitat types through accepted silvicultural practices. Methods include, but are not limited to:

  1) Utilize single tree or small group selection of up to 1/2 acre group sizes, 2) target age class under management are 100-200 years; and, 3) cutting cycles of 15 to 20 years in order to maintain understory development.

Sub-Objective 3.1d (Woodcock Focus Areas)

Manage the 2,664 acres in woodcock focus areas to provide and sustain all life stage habitat requirements for woodcock.

- Use accepted silvicultural practices in woodcock focus areas (map 2-2) to create openings, promote understory development, and sustain early successional habitat for American woodcock and Canada warbler. Generally, use group selection, clearcuts or patch cuts of up to 5 acres in size. Some larger roosting fields may also be maintained. Cutting cycles will be approximately 8-10 years on a 40 year rotation. Some 3-5 acre openings may be permanently maintained primarily by mowing and brush clearing using mechanized equipment.

- Perpetuate aspen-birch communities where they exist, and strive to achieve an appropriate distribution of regenerating, young, mid and mature age classes

- Conduct woodcock singing male surveys to document wildlife response to habitat management.

Focal Species Habitat Requirements

The blackburnian warbler is associated with mature conifer habitats (> 80% canopy cover) of spruce, fir, hemlock, and pines, and in spruce-fir/hardwood mixed habitats including deciduous stands with patches of conifers. It nests and gleans insects in the upper canopy of conifers, especially spruce and hemlock, if present, and rarely pines (DeGraaf and Yamasaki 2001). Males sing from the tops of the tallest conifers, preferably over 60 feet. The blackburnian warbler is a moderate priority with a high regional responsibility within Bird Conservation Region (BCR) 14 (Dettmers 2005). Approximately 25% of the global population occurs in this region. This warbler is of conservation concern because of its relatively small total range, its preference for mature conifers, and its restricted winter range in the subtropical forests of northern South America. Declines are recorded for New England although the overall population appears to be stable. It is considered a forest interior species, susceptible to forest fragmentation and short rotation timber harvesting (50 years or less) (Hagen et al. 1996; Morse 2004). The effects of forest fragmentation, loss of hemlock to wooly adelgid, and deforestation on the wintering grounds are issues of concern to the conservation of this species (Morse 2004). The 2005 Maine CWCS lists the loss of hemlock as the chief threat to this species' conservation in Maine and identifies habitat conservation and research as the two highest priorities in the state for conserving their population state-wide (MDIFW 2005a).

The Canada warbler is declining across much of its range and is listed as highest priority in BCR 14 (Dettmers 2005). This bird is found throughout the watershed, and is not tied specifically to any of the three refuge upland habitat types, but may be tied more directly to a well-developed understory or shrub layer. PIF

also has a goal of increasing the Canada warbler continental population by 50% (Rich et al. 2004). The Maine CWCS identifies habitat conservation and research as the two highest priorities in the state for conserving Canada warblers (MDIFW 2005a).

The black-throated green warbler is one of the forest-interior species most closely associated with a mixed forest. Black-throated green warblers are a moderate priority in BCR 14, with a high regional responsibility (18.4% of the global population), and a moderate regional threat level. This species is generally abundant and stable in the region. Although it occupies a wide range of forested habitat types, in the Northeast, it occurs at highest densities in closed canopy mid-to-mature forest with a significant conifer component. This foliage-gleaning warbler generally forages high in the canopy, but at a lower height than blackburnian warblers (Morse 1967). Spruce (particularly red spruce) and paper birch are favored foraging substrates. Although it will nest in deciduous trees, preferred nest sites are in dense conifer foliage on a limb or tree fork, at a height of about 20 ft. (DeGraaf 2001; Foss 1994). Large spruce trees are favored male singing perches (Morse 1993). Black-throated green warblers appear to require fairly large forest patches and a generally forested landscape (Norton 1999). Askins and Philbrick (1987) found that they disappeared from a 250 acre forest tract that became isolated from other forested habitat. Black-throated green warbler densities also decline in heavily thinned forest (Morse 1993). However, structurally heterogeneous forests that include small gaps provide improved foraging opportunities for this warbler (Smith and Dallman 1996).

The American woodcock is a highest priority species in BCR 14 (Dettmers 2005). Woodcock require several different habitat conditions that should be in close proximity to one another, and can consist of both uplands and wetlands habitat types. These include clearings for courtship (singing grounds), large openings for night roosting, young, second-growth hardwoods (15-30 years) for nesting and brood-rearing, and foraging areas (Sepik et al. 1981; Keppie and Whiting 1994). These habitat conditions occur naturally on the refuge and can be expanded through habitat manipulation. Lorimer and White (2003) estimate that natural disturbances in the pre-settlement forests created about 1-3% early successional habitat in mixed woods and northern hardwood forests and up to 7% in spruce flats that are more susceptible to blowdown.

Other Species Benefiting From Our Focal Species Management

As we described in the introduction to this alternative, we selected focal species, in part, because we believe their habitat requirements also represent the habitat needs for many other Federal trust and native wildlife species dependent on that respective habitat type. For example, other birds of high conservation concern in BCR 14 that breed or forage in the mixed forest which we expect will benefit over the long-term from our management include: bay-breasted warbler (BCR highest priority), and boreal chickadee, Cape May and black-throated blue warblers (BCR high priority). Cape May and bay-breasted, in particular, prefer stands dominated by conifer, or pure conifer, which our management under this alternative would emphasize. While these species do not presently occur at high densities in our area, we predict their presence and breeding pair numbers would increase as our forest management tends toward favoring spruce, and as we allow for some stands to tend toward older age classes. Specifically, we may begin to see direct benefits to Cape May and bay-breasted warblers after 25-50 years of our proposed forest management under this alternative.

Our management for focal species on both currently-owned and proposed refuge lands, would also serve to ensure long-term conservation of critical deer wintering areas, and provide habitat connectivity for wide-ranging mammals

including American marten, fisher, bobcat, black bear (Ray 2000), and potentially for the Federal-listed lynx, although it has not been documented in the immediate area (re: chapter 3, mammals discussion). Both state agencies have identified certain deer wintering areas as critical to maintaining the region's deer population and both have regulations and policies in place for their protection. In these areas, deer annually congregate in large numbers for protection and survival against wind, deep snow, and extreme cold. Typically, the deer wintering areas lie in lowland conifer or conifer-dominated mixed stands, 35 feet or taller, where there is a high crown closure, approximately 70% (Reay 1990). In addition, there are patches of hardwoods or softwoods within or near the core of the area at a height accessible to deer as browse. We predict that management strategies for our focal species would provide these stand attributes, and thus, management of deer wintering areas complements our habitat management priorities. Map 2-9 identifies critical deer wintering areas on or adjacent to the refuge provided by NHFG and MDIFW.

The 2005 New Hampshire WAP includes a list of "important wildlife" that may benefit from conserving mixed forest habitat types (NHFG 2005). Besides the species mentioned previously, species known on the refuge include: Cooper's hawk, hoary bat, northern goshawk, three-toed woodpecker, blue-spotted salamander, northern myotis, ruffed grouse, wild turkey, veery, wood thrush, yellow-bellied sapsucker, American redstart, ovenbird, blue-headed vireo, and rose-breasted grosbeak. Appendix N, table N.1, lists additional species of conservation concern that will benefit from our management by habitat type.

Summary of Upland Forest Management Proposal

Our management emphasis over the next 15 years would be to maintain, enhance, create and/or restore the habitat attributes important for sustaining the focal species identified in the objective statement. Appendix K provides additional guidance we are proposing to follow. During the next 15 years, we would primarily manage the mixed spruce-fir/northern hardwood forest on current refuge lands within the habitat units we identify in appendix K.

The refuge currently owns, or has approval to acquire, 13,874 acres of upland forest. Under the alternative B expansion proposal, we recommend Service fee simple acquisition of an additional 28,575 acres of upland forest, and purchase of conservation easements on another 17,080 acres. Fee acquisition would allow for full management capability on those lands. On these easement lands, our objective would be to purchase the minimum rights necessary to insure quality wildlife habitat would be permanently sustained. Typically, we would purchase at least development rights; however, we could purchase additional rights as needed. The Service works on a willing seller-only basis, and it would be up to the landowner to determine what additional management rights, if any, would be sold.

Given our long-term habitat management and land acquisition proposals under alternative B, we estimate refuge fee lands could provide high quality breeding habitat in the mid- and mature-aged spruce-fir and mixed woods habitat types to support up to approximately 4,321 pairs of blackburnian warblers (based on an estimated density of 4.94 acres/pair), and 3,141 pairs of black-throated green warblers in (based on an estimated density of 6.79 acres/pair) (Randy Dettmers, personal communication, 2006). In addition, refuge fee lands could provide high quality breeding habitat in the mixed woods and northern hardwoods habitat types to support up to approximately 1,639 pairs of Canada warblers (based on an estimated density of 13.84 acres/pair). In the refuge's woodcock focus areas (map 2-2), there would be high quality habitat to support up to approximately 280 American woodcock singing males (based on an estimated density of 23.8 acres/singing male) (Andrew Weik, personal communications, 2006). We recognize,

however, that these estimates are based on habitat acres alone, and may not fully take into account intra-specific competition among other breeding bird species in the same area.

In summary, and presented in table 2.1 below, our management would have the potential to directly contribute towards the BCR 14 goals for each of these species of conservation concern (Randy Dettmers, personal communication, 2006).

Table 2.1. Potential number of refuge focal species breeding pairs/singing males supported in refuge's upland forest habitat types under alternative B management

Refuge Focal Species	Refuge Habitat Type	Number of Potential Breeding Pairs/ Singing Males Supported
Blackburnian warbler	Mid-and mature aged spruce-fir and mixed woods	4,321 pair
Black-throated green warbler	Mid-and mature aged spruce-fir and mixed woods	3,141 pair
Canada warbler	Mixed woods and northern hardwoods	1,639 pair
American woodcock	Woodcock Focus Areas	280 singing males

In addition, results from a Canadian study evaluating mean total density of all birds in various habitats indicate that under full implementation of this objective, over the long term, refuge fee lands could contribute a potential mean total density, inclusive of all breeding birds, of over 9,273 bird pairs in the spruce-fir and mixed woods habitat types combined (based on an estimated mean total density of 2.3 acres/pair), and 4,204 bird pairs in the northern hardwoods habitat types (based on an estimated mean total density of 2.48 acres/pair) (Kennedy et al. 1999).

Goal 4 Provide high quality wildlife-dependent activities such as hunting, fishing, wildlife observation, and photography

Objective 4.1 (Hunting)
Within 3 years of CCP approval, at least 80% of hunters on the refuge will report that they had a high-quality experience.

Rationale
Hunting is identified in the 1997 Refuge Improvement Act as a priority public use. Priority public uses are to receive enhanced consideration when developing goals and objectives for refuges. Further, hunting is an established traditional use in the local area. We have implemented a hunt program on the refuge during the past 6 years.

In April 2007 we issued an amended Refuge Hunt Plan and environmental assessment after a 30 day public review and comment period. With our stated hunt program objectives, we intend to: 1) maintain a diversity of habitats within the refuge that are capable of supporting a diversity and abundance of wildlife species, and 2) provide wildlife-dependent recreational opportunities. We recognize hunting as a healthy, traditional, outdoor pastime that is deeply rooted in American heritage and, when managed appropriately, can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs. It is also a priority public use on national wildlife refuges.

The refuge hunt program was first implemented during 2000, consistent with state regulations, and additional refuge regulations stipulated in 50CFR.

Refuge lands were opened to migratory game bird and waterfowl and small and big game hunting. In April 2007, we amended the 2000 Refuge Hunt Plan and associated environmental assessment, and our Regional Director issued a new Finding of No Significant Impact. The amendment was completed to provide a more detailed analysis of the potential cumulative effects of the current hunt program. Under alternative B, we propose to add a turkey hunt on refuge lands in both states, and a bobcat hunt on refuge lands in Maine, consistent with both states' regulations. All other regulations under the current program would apply. As we acknowledge under this chapter's section "Actions Common to All Alternatives; Additional NEPA Analysis," we are not analyzing these additional hunts in sufficient detail in this document to comply with NEPA. Implementation of those new hunts would require a separate environmental analysis, including public involvement opportunities.

Providing a high-quality hunt on the refuge promotes visitor appreciation and support for refuge programs. A quality hunting experience is one that: 1) maximizes safety for hunters and other visitors; 2) encourages the highest standards of ethical behavior in taking or attempting to take wildlife; 3) is available to a broad spectrum of the hunting public; 4) contributes positively to or has no adverse effect on population management of resident or migratory species; 5) reflects positively on the individual refuge, the System, and the Service; 6) provides hunters uncrowded conditions by minimizing conflicts and competition among hunters; 7) provides reasonable challenges and opportunities for taking targeted species under the described harvest objective established by the hunting program; 8) minimizes the reliance on motorized vehicles and technology designed to increase the advantage of the hunter over wildlife; 9) minimizes habitat impacts; 10) creates minimal conflict with other priority wildlife-dependent recreational uses or refuge operations; and 11) incorporates a message of stewardship and conservation in hunting opportunities. These are all criteria we will use to evaluate our hunt program.

Strategies
In addition to objective 4.1 strategies under alternative A:

Within 1 year of CCP approval:

- Initiate administrative process to incorporate the new turkey hunt on refuge lands in both states, and a new bobcat hunt on refuge lands in Maine. Develop a new Hunt Plan opening package, including new NEPA document, Federal Register notice, and public involvement opportunities. Both new hunt additions will be consistent with respective states' regulations and refuge regulations.

Within 5 years of CCP approval:

- Establish an inter-state (New Hampshire and Maine) and Service Umbagog Lake Working Group to annually review hunting seasons in an effort to make seasons as consistent as possible
- Develop annual hunt plan after annual state meetings
- Evaluate numbers and distribution of waterfowl blinds each year, including placement of blinds on Maine side of refuge
- Waterfowl hunters would have priority for using blinds during the hunt season
- Establish additional parking areas off of the current road network to facilitate hunting in the expansion area as lands are acquired

Within 5-10 years of CCP approval:

- Provide literature, training, and other outreach tools targeting accurate identification of species of concern on the refuge (e.g. at check stations, kiosks, signage)

- Conduct surveys, or develop reporting system such as check station or permit system, to collect data for evaluating numbers and quality of program

Within 10-15 years of CCP approval:

- Evaluate pull-outs and parking areas for safety, and improve or relocate where necessary; also evaluate opportunities to provide access for people with disabilities

- Try to distribute the hunting pressure through use of maps and outreach

Objective 4.2 (Fishing)
Within 4 years of CCP approval in cooperation with the states, provide opportunities such that at least 80% of anglers on the refuge, or accessing the lake through the refuge, report they had a high-quality experience.

Rationale
Fishing is identified in the Refuge Improvement Act as a priority public use. Priority public uses are to receive enhanced consideration when developing goals and objectives for refuges. Providing high quality fishing opportunities for the public to engage in this activity on the refuge promotes visitor appreciation and support for refuge programs.

USFWS
Preparing to fish on the lake

We would continue to allow access for fishing, in accordance with states of Maine and New Hampshire regulations, except in sensitive areas during nesting season. We propose to develop a new fishing access site on existing refuge lands at Mountain Pond, in conjunction with new trail and parking area plans. In addition, we propose to develop a new boat access site in the expansion area on Sturtevant Pond, once those lands are acquired.

We define a high quality fishing program as one which 1) maximizes safety for anglers and other visitors; 2) causes no adverse impact on populations of resident or migratory species, native species, threatened and endangered species, or habitat; 3) encourages the highest standards of ethical behavior in regard to catching, attempting to catch, and releasing fish; 4) is available to a broad spectrum of the public that visits, or potentially would visit, the refuge; 5) provides reasonable accommodations for individuals with disabilities to participate in refuge fishing activities; 6) reflects positively on the Refuge System; 7) provides uncrowded conditions; 8) creates minimal conflict with other priority wildlife-dependent recreational uses or refuge operations; 9) provides reasonable challenges and harvest opportunities; and 10) increases visitor understanding and appreciation for the fishery resource

Strategies
In addition to objective 4.2 strategies under alternative A:

Within 5 years of CCP approval:

- Assist partners in conducting creel and angler surveys

- Work with partners to maintain or restore a trophy brook trout fishery in the Rapid River, and a quality brook trout fishery in the Dead Diamond and Dead Cambridge rivers and tributaries; work with Umbagog Working Group to implement recommendations from the Eastern Brook Trout Joint Venture once their strategic plan is completed

- Officially open the refuge to fishing through 50CFR regulations and develop a fishing plan

- Continue to restrict anglers from sensitive nesting areas or other areas determined to be high wildlife impact areas; establish thresholds of acceptable

change when restrictions may be imposed to minimize impacts; Distribute angling pressure through maps and outreach

- Continue annual "Take Me Fishing" event
- Work with states through interstate commission, or other forum (e.g. proposed Umbagog Lake Working Group), to develop consistent fishing regulations on lead tackle

Within 5-10 years of CCP approval:

- Provide improved shoreline access (e.g. trails, docks, etc)
- Improve opportunities for handicapped access to high quality fishing areas
- Construct safe pullouts
- Establish additional parking areas off of the current road network to facilitate fishing in the expansion area as lands are acquired
- Provide walk-in fishing access to Mountain Pond in conjunction with new trails and parking area plans
- Develop boat access site at Sturtevant Pond once shoreline is acquired

Within 10-15 years of CCP approval:

- Work with states to eliminate fishing tournaments on Umbagog Lake to maintain reasonable solitude and a natural experience for anglers and other users.

Objective 4.3 (Wildlife Observation and Photography)
Within 2 years of CCP approval, at least 80% of refuge visitors engaged in wildlife viewing and nature photography will report a high quality experience

Rationale
Wildlife observation and photography are identified in the Refuge Improvement Act as priority public uses. Priority public uses are to receive enhanced consideration when developing goals and objectives for refuges. Providing high quality opportunities for the public to engage in these activities on the refuge promotes visitor appreciation and support for refuge programs.

This alternative expands upon alternative A by enhancing infrastructure to increase wildlife observation and photography opportunities. Additional trails would be created on refuge lands in the Potter Farm and Thurston Cove areas, and Mountain Pond (see map 2-8). These trails would be supplemented with observation platforms and photography blinds. Location of the trail, platforms, and blinds are planned to provide visitors with quality viewing opportunities without disturbing the wildlife. Refuge trails and roads would remain open year-round from ½ hour before sunrise to ½ hour after sunset, except as otherwise permitted under a special use permit. Access to trails is by foot travel, including snowshoeing and cross country skiing, or by snowmobile on refuge-designated snowmobile trails.

We have also identified one trail in the expansion area we would like to develop for year round use once those lands are acquired. It parallels Route 16, connecting Wentworth Location to Errol, and we preliminarily refer to it as the potential "Long Pond Trail." It is currently a snowmobile trail, but could also be developed to provide a year round viewing and photography opportunity. Also in the expansion area, generally, we would plan to keep gravel roads open to vehicle travel to afford additional opportunities for wildlife observation and photography.

We define high quality wildlife observation and photography programs as those in which: 1) observation occurs in a primitive setting or use safe facilities and provide an opportunity to view wildlife and its habitats in a natural setting; 2) observation facilities or programs maximize opportunities to view the spectrum species and habitats of the refuge; 3) observation opportunities, in conjunction with interpretive and educational opportunities, promote public understanding of and increase public appreciation for America's natural resources and the role of the Refuge System in managing and protecting these resources; 4) viewing opportunities are tied to interpretive and educational messages related to stewardship and key resource issues; 5) facilities, when provided, blend with the natural setting, station architectural style, and provide viewing opportunities for all visitors, including persons with disabilities; 6) observers understand and follow procedures that encourage the highest standards of ethical behavior; 7) viewing opportunities exits for a broad spectrum of the public; and 8) observers have minimal conflict with other priority wildlife-dependent recreational uses or refuge operations.

Strategies
In addition to objective 4.3 strategies under alternative A,

Within 5 years of CCP approval:

- Provide literature on wildlife viewing opportunities at kiosks and visitor contact facilities
- Designate self-guided canoe trail, with information on wildlife viewing, on Magalloway River
- Close wildlife viewing sites as warranted during nesting season or other sensitive times of the year
- Develop web-based or other wildlife viewing reporting system

Within 5-10 years of CCP approval:

- With partners, promote an Upper Androscoggin watershed regional wildlife viewing trail system (e.g. auto, boat, snowmobile, etc) across ownerships
- Construct wildlife viewing pull-outs at safe, strategic locations (e.g. moose wallows) on Route 16 and 26
- Provide sensitively placed access to view unique fens and bogs
- Create webcam near loon, eagle, and osprey nests
- Work with partners to identify and promote wildlife viewing opportunities on and off the refuge
- Provide ADA compliant photo blinds
- Consider use of temporary blinds for photography in certain sensitive locations where permanent blinds are not appropriate
- Construct new trails: the Potter Farm and Thurston Cove group of loop trails, Mountain Pond area trails, and along Route 16 in the expansion area; make at least one of these ADA compliant to the extent feasible

Objective 4.4 (Camping on Umbagog Lake)
Maintain overnight lake experiences on refuge lands, on no more than 12 remote lake sites, to facilitate compatible, safe and unique hunting, fishing, wildlife observation, and photography opportunities.

Rationale
We currently allow camping on refuge lands on 12 remote sites on Umbagog Lake. Two additional river sites are planned for elimination and rehabilitation. Our lake camping program is administered by NH DRED- Division of Parks and Recreation in conjunction with their management of other camping sites, on state and other ownerships, and the management of the Umbagog State campground. Remote camping on Umbagog Lake provides the unique opportunity for visitors to view moose, and hear loons during dusk and dawn when they are most actively calling, while allowing the visitor to be totally immersed in a quiet, private, primitive, and natural setting. Remote lake camping is becoming an increasingly rare experience in the Northeast, except in very remote northern areas. Similar to hunting and fishing, camping is an historic, traditional, and very popular activity on Umbagog Lake and in other rural parts of New Hampshire and Maine.

Under alternative B we would plan to enhance our current camping program and increase site monitoring to ensure: site conditions are not deteriorating; wildlife is protected; and, campers adhere to regulations. We would complete a formal cooperative agreement with NH DRED- Division of Parks and Recreation. Our agreement would include the provision that we would not increase the current capacity for camping on refuge lands. In cooperation with NH DRED- Division of Parks and Recreation and other partners, we would establish thresholds on what is acceptable change to resources and determine when restrictions or mitigation measures should be imposed to reverse impacts before any damage is permanent. We would also require campers to adhere to "Leave No Trace" principles. The Leave No Trace program is a nationally recognized curriculum of outdoor values that promotes visitors' ethical use of recreational lands. Our outreach program would include distribution of literature and demonstration of Leave No Trace principles.

Strategies
In addition to objective 4.4 strategies under alternative A:

Within 5 years of CCP approval:

- Complete cooperative agreement with NH DRED. It will include: 1) setting fees; 2) limits on number of campers at individual sites; 3) sanitation requirements, 4) resource, and long-term site protection and restoration needs; 5) required orientation to campers; and, 6) boat access only, no personal water craft;

- Manage camping through site locations, and scheduling of day and season lengths, to provide a quality experience while providing maximum protection for wildlife resources

- Establish a program of increased outreach on-site, and increased enforcement of rules and regulations to minimize illegal camping

- Consider designating some sites as "one night only" for paddlers moving through the area

- Provide campers with an orientation and overview of rules and regulations and Leave No Trace program

- Restore sites or seasonally close sites as needed to protect resources

- Remove camping sites at North 1 and North 2, administered through Mollidgewock State Campground, along Route 16

- Limit group size; no pets; no loud music (external speakers)

Within 5-10 years of CCP approval:

- Establish inter-governmental and inter-jurisdictional Umbagog Lake Working Group to develop formal cooperative management agreement encompassing cooperative management of the entire lake area.

- Improve campsites to address safety, long term sustainability without degradation, provide a diversity of site locations and opportunities, and resolve social, environmental, and resource issues,

Objective 4.5 (Boating)
Within 4 years of CCP approval, at least 80% of boaters passing through the refuge on the Magalloway and Androscoggin rivers, and associated designated waterways, will report they had a high quality experience based on the following criteria: a) suitable access; b) minimal conflict with other users; c) safe experience; and d) a reasonable chance to view wildlife in a natural setting with minimal disturbance.

Strategies
In addition to objective 4.5 strategies under alternative A:

Within 5 years of CCP approval:

- Develop an interpretive self-guided canoe/kayak trail for the Magalloway River; interpret management activities and habitats visible from trail; promote a "Leave No Trace" boater ethic

- Improve maps and interpretive literature for boaters

Boating on the refuge

Ian Drew/USFWS

- Place registration boxes at boat launches to obtain better information on group size, seasons of use, destination, etc.

- Work with recreation specialists to determine the best way to document use and identify conflicts

- Continue outreach program to alert boaters to closed areas and its purpose to protect nesting wildlife

Within 5-10 years of CCP approval:

- Work with partners, including proposed Umbagog Lake Working Group, to manage boater access (types, numbers, and distribution) along lakes and rivers; establish thresholds of acceptable change identifying when restrictions may need to be imposed to maintain visitor experiences and protect natural resources

- Seek opportunities with partners to evaluate visitor opportunities within an Upper Androscoggin River watershed regional context (e.g. regional auto, walking, and boat trails, visitor centers, tours, etc)

- Develop water ethics/etiquette brochure and interpretive literature at strategic locations (e.g. boat launches, kiosks, offices)

- Encourage day-use paddling rest sites at Steamer Diamond, Wentworth Location, and new refuge office

Goal 5 Develop high quality interpretive opportunities, and facilitate environmental education, to promote an understanding and appreciation for the conservation of fish and wildlife and their habitats, as well as the role of the refuge in the Northern Forest.

Objective 5.1 (Interpretative Programs: on-refuge emphasis)
Every year, at least 80% of visitors contacted after attending refuge interpretive programs will be able to identify one of the following: 1) be able to identify the refuge's purpose; 2) name at least one refuge focus species and a management action to benefit the species; 3) describe the refuge's role in conserving the Northern Forest, 4) understand the refuge's contribution to the Refuge System and to regional migratory bird conservation.

Rationale
The National Association of Interpreters defines "interpretation" as a communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource. Interpretation is a priority public use identified in the 1997 Refuge Improvement Act and it is one of the most important ways we can raise our visibility, convey our mission, and identify the significant contribution the refuge makes to wildlife conservation. Public understanding of the Service and its activities in the states of New Hampshire and Maine is currently very low. Many are unaware of the Refuge System and its scope, and most do not understand the importance of the refuge in the conservation of migratory birds.

Providing high quality opportunities for the public to engage in environmental interpretative activities promotes stewardship of natural resources, and an understanding of the refuge's purpose. They also garner support for refuge programs and help raise public awareness of the role of the refuge in Northern Forest and its contribution to migratory bird conservation.

We define high quality interpretive programs as those which: 1) increase public understanding and support for the Refuge System; 2) develop a sense of stewardship leading to actions and attitudes that reflect concern and respect for wildlife resources, cultural resources, and the environment; 3) provide and understanding of the management of our natural and cultural resources; and 4) provide safe, enjoyable, accessible, meaningful, and high quality experiences for visitors increasing their awareness, understanding, and appreciation of fish, wildlife, plants, and their habitats.

We have identified several new trail opportunities on current refuge lands and one in the expansion area. These were described under our wildlife observation and photography discussion above. As additional lands are acquired in the expansion area we would also evaluate their potential to provide high quality interpretive opportunities.

Strategies
In addition to objective 5.1 strategies under alternative A:

Within 5 years of CCP approval:

- Hire a VSP to implement programs and develop a Visitor Service's step-down plan incorporating objectives, finalizing strategies, and coordinate the evaluation of visitor numbers, visitor satisfaction, visitor impacts, carrying capacity, and thresholds of acceptable change.

- Improve on existing brochures and develop new ones interpreting management practices and focus species needs; also, develop self-guided walking trail guides as new trails are constructed

- Establish a self-guided interpretive canoe/kayak trail along the Magalloway River
- Establish self-guided interpretive signs along approved snowmobile trails in partnership with local snowmobile clubs and businesses
- Assess interpretive opportunities in expansion areas as lands become available
- Provide interpretation signs at the Magalloway River trail; including information at trailhead
- Construct information and interpretive kiosks at boat launches, overlooks, roadside pullouts, and any new trailheads

Within 5-10 years of CCP approval:

- Provide a limited number interpretative programs at two State campgrounds each year, in cooperation with State Parks Staff; utilize volunteers or Friends Group to the extent possible
- Sponsor a limited number of guided interpretive programs on refuge via walks, canoes, kayaks, and/or pontoon boat; utilize volunteers or Friends Group to the extent possible
- Incorporate into Visitor Services plan a procedure for evaluating effectiveness of programs by doing a pre-test, then a post test, or design an evaluation into each program
- Continue to seek funding to finish construction of self-guided Magalloway River trail and new loop extension, and make it ADA compliant
- Construct new interpretative trails: the Potter Farm and Thurston Cove group of loop trails, Mountain Pond area trails, and one along Route 16 in the expansion area trail; make at least one of these ADA compliant to the extent feasible

Within 10-15 years of CCP approval:

- Develop at least 2 pull-outs off Highways 16 and 26 on the refuge where wildlife viewing opportunities exist
- Develop an overlook at Route 26-New Hampshire line

Objective 5.2 (Community Outreach)
Each year, provide at least 10 opportunities for elected officials, local community leaders, neighbors, and other stakeholders to become more informed about the refuge and its resources and our management priorities.

Rationale
Greater outreach efforts will increase recognition of the refuge, the Refuge System, and the Service among neighbors, local leaders, conservation organizations, and elected officials. We will strive to annually increase outreach efforts toward the local citizenry. This publicity will also help generate support for similar conservation efforts in the region.

It is particularly important that local residents understand, appreciate, and support the Refuge System mission and this refuge's unique contribution to that mission. In addition, our volunteer program could grow and our Friends group could see enhanced membership and support. The proposed Refuge Headquarters and visitor contact facility will serve as an important resource for refuge visitors and local community, providing educational and recreational opportunities, as well as meeting and exhibit space for local conservation organizations.

Gaining support from local community, private landowners, private conservation groups, Congressional, State, and local elected officials, for refuge programs is essential to meeting our goals. This can only happen when these elected officials understand and appreciate the nationally significant contribution of the refuge and its programs to the permanent protection of Federal trust resources. We need to impress upon these individuals the importance of refuge lands to current and future generations of Americans.

Strategies
In addition to objective 5.2 strategies under alternative A, expand activities to:

Within 5 years of CCP approval:
- Update refuge fact sheets
- Create press kit continue to promote events scheduled on refuge
- Respond to requests for presentations at local service organizational meetings, chamber events, etc
- Participate in those community service, professional associations, and chamber events throughout Upper Androscoggin watershed that would provide the greatest benefit to achieving goals and objectives and furthering the mission of the Refuge System
- Maintain web page
- Establish/maintain a regional media list including newspapers, radio, television
- Foster relationship with selected individuals; personally invite them to refuge activities
- Contact landowners each year to inform them of refuge activities.
- Consider having annual meetings with interested adjacent landowners to facilitate communications, raise awareness and understanding of, and seek support for, refuge management programs

Within 5-10 years of CCP approval:
- Consider a webcam at eagle and loon nesting sites

Within 10-15 years of CCP approval:
- Develop web-based outreach and interpretive materials, e.g. virtual tour

Refuge webpage

Objective 5.3 (Visitor Awareness)
Within 2 years of CCP approval, at least 80% of refuge and Umbagog Lake visitors will be aware of public use opportunities and restrictions put in place to protect trust resources and provide quality public use opportunities.

Rationale
Same as rationale for objective 5.2 strategies under alternative B

Strategies
Within 5 years of CCP approval:

- Place informational signs at critical spots (visitor concentration areas)

- Develop and distribute map and other outreach materials for visitors to understand where permitted activities can occur and how they can access; map will portray closed areas, gates, etc; other outreach materials will why area closures and other restrictions are necessary to protect resources

- Utilize refuge web site to distribute information; update and maintain current its information

- Also, see other objectives under goal 4 for specific program recommendations

Within 5-10 years of CCP approval:
- Develop a public access management plan, working with States and other partners providing public access to Umbagog Lake; establish thresholds of acceptable change which, when exceeded, may warrant that access restrictions be put in place

- Utilize public forums to raise awareness and explain access restrictions

Objective 5.4 (Environmental Education Opportunities)
Facilitate environmental education opportunities on the refuge, in partnership with other educators, to explain the importance of conserving and managing the natural resources in the Northern Forest to students, teachers, and other visitors. All who participate in environmental education programs on the refuge will be able to 1) understand the need for migratory bird conservation; 2) identify the refuge's role in the Refuge System and in conserving Northern Forest Federal trust resources, and 3) name at least one refuge focus species and a management action to benefit the species.

Rationale
Environmental education is a process designed to develop a citizenry that has the awareness, concern, knowledge, attitudes, skills, motivations, and commitment to work toward solutions of current environmental problems and the prevention of new ones. Environmental education is identified in the 1997 Refuge Improvement Act as priority public use. Providing high quality environmental education opportunities for the public on a refuge can: promote stewardship of natural resources; develop an understanding of the refuge's purposes and the mission of the National Wildlife Refuge System; and, help raise awareness, understanding, and an appreciation of the role of the refuge in the Northern Forest and its contribution to migratory bird conservation. It also can garner support for other refuge programs.

As we evaluated the future of this program, in comparison to our other priority public use programs, we determined our emphasis would be to facilitate the use of the refuge for educational programs, but look to our partners, Friends Group, and/or volunteers to develop any curriculum and to lead those programs. This recommendation is based on consideration of this plan's 15-year timeframe and what we can reasonably expect for staffing and operational funds, and because we believe our other priority public use programs would be more effective in reaching more visitors. We do not want to imply that we do not value environmental education, but only wish to convey that, on this refuge, the majority of our limited visitor services resources would be best spent in other priority public use programs.

Strategies
Within 5 years of CCP approval:
- Provide educational materials on the refuge web site

- Provide materials to local schools, upon request, as they develop curriculum related to refuge resources

- Facilitate opportunities for state and local partners, colleges or universities, or other educational program coordinators to lead nature-based educational programs on refuge lands

Within 5-10 years of CCP approval:
- Evaluate potential for state and other partners to provide opportunities for adult education programs, such as Elder Hostel

- Work with NHFG, MDIFW, and university extension and conservation education partners to facilitate complementary programs and to seek assistance in implementing program requests

Goal 6 Enhance the conservation and management of fish and wildlife resources in the Northern Forest Region through partnerships with public and private conservation groups, private landowners, State and local entities.

Objective 6.1 (Regional and Community Partnerships)
Actively engage in regional and community economic development and conservation partnerships and initiatives, consistent with the Refuge System mission and refuge purposes.

Rationale:
These objectives would encourage broader cooperation between the Service and local communities. Partnerships are essential for this refuge to accomplish projects and programs. Further, the Service can provide valuable technical assistance to local conservation organizations, particularly on management of habitat for migratory birds. In addition, the potential for the creation of a regional Umbagog Area Friends Group would be explored.

This objective also builds on alternative A by fostering relationships with elected officials and business leaders, thereby strengthening political support for the refuge and its programs. This objective would also raise the awareness of opportunities for compatible outdoor recreational uses. These uses will attract visitors to the area and contribute to the local economy.

Law enforcement staff plays an important role on the refuge. Officers not only enforce regulations, but just as importantly, they conduct outreach and serve to raise the visibility of the Service in local communities while out on patrol. It will be even more important in the future, should we implement this alternative with new programs and new regulations, that we have the capability to alert people to these changes and can enforce them, as necessary. We believe that a law enforcement partnership could substantially increase our ability to effectively manage and conserve refuge resources.

Strategies
In addition to objective 6.1 strategies under alternative A,

Within 5 years of CCP approval:
- Share resources, equipment, and expertise with State and private landowners.

- Become a member of established associations, such as the Upper Androscoggin Advisory Committee

Within 5-10 years of CCP approval:

- Work with conservation partners to achieve common goals; establish MOU, Memorandum of Agreement (MOA) and cooperative agreements as appropriate

Objective 6.2 (Cooperative Management of Umbagog Lake)
Promote responsible use and management of Umbagog Lake, associated rivers, and adjoining uplands in partnership with other jurisdictional and management agencies (see also Goal 4, Objective 4.4).

Rationale: See rationale for objective 6.1 under alternative B.

Strategies
In addition to strategies under "Actions Common to all of the Alternatives" affecting this program:

Within 5-10 years of CCP approval:

- Exchange with partners, techniques and ideas on managing public use on Umbagog lake, its tributaries, and associated uplands

- Work with States of New Hampshire and Maine to establish an Umbagog Lake Working Group with responsibility to develop consistent regulations and best management practices for activities on the lake and rivers, including: a) wake zones; b) fishing regulations, including fishing tackle; c) boating regulations; d) allowed events/tournaments; e) invasive species management, such as plants and bass; f) outfitter and guide licensing; g) boater ethics program, including waste disposal protocol; h) camp site management; i) other motorized activities, including PWC, float planes; j) promote/develop appropriate locations for access; k) launch sites

- Also, specifically work with Umbagog Lake Working Group to resolve the Rapid River user conflicts among anglers and boaters; develop management strategy (e.g. control access, require permits, schedule launches, limit numbers, etc)

Objective 6.3 (Partner-managed Visitor Facilities)
Within 10 years of CCP approval, develop a visitor contact facility in Errol with partners, where all the visitors to this facility have access to information on outdoor opportunities in the Umbagog area. The Services' role in the facility is to interpret the refuge's contribution to the conservation and management of the Northern Forest and its wildlife resources.

Rationale: See rationale for objective 6.1 under alternative B.

Strategies
Within 5 years of CCP approval:

- Explore other opportunities to display refuge visitor contact information at strategic portal areas (e.g., Evans Notch Visitor Center, Colebrook center, Northern Forest Heritage Park)

- Provide map with what's open; e.g. roads snowmobile trails, pull outs, parking, boat launches, river trail

Within 5-10 years of CCP approval:

- Work with chamber of commerce, NHFG, MDIFW, and New Hampshire Division of Parks and Recreation, Town of Errol, local businesses, conservation organizations to evaluate regional opportunities for visitors services that include the refuge

- With partners, develop an MOU to create a staffed visitor contact facility in town; refuge would only provide supplemental support for staffing. Purpose of facility is to allow visitors to: 1) receive information on what nature-based opportunities are available in the local area; 2) know where to go; and 3) make whatever arrangements and contacts needed for their visit.

- Pursue alternative funding sources (e.g., State highways grants, main street grants, scenic byways, SAFETEA) to maintain partner run facilities that promote refuge vision and goals

- Provide services such as selling hunting permits, providing maps, making reservations. Also, offer limited interpretative program, develop exhibits, provide basic orientation: short video; interactive kiosk, some natural history museum pieces (native wildlife displays)

- Provide visitors with information on programs available on the refuge

Goal 7 Develop Umbagog National Wildlife Refuge as an outstanding center for research and development of applied management practices to sustain and enhance the natural resources in the Northern Forest in concert with the Refuge System Land Management Research Demonstration (LMRD) program.

Objective 7.1 (Research and Applied Management)
Within 5 years of CCP approval, establish a forest research and management program on refuge lands that enhances the best available science for making management decisions which benefit wildlife resources.

Rationale
Fortunately for us, researchers from many universities, state and Federal agencies and non-governmental organizations have conducted research and provided us with valuable information on refuge resources. Without these partnerships, we would not have had the staff or funding to accomplish this important work on our own. We will continue to support cooperative research that benefits the Refuge System, refuge purposes, goals, and objectives. Some of the projects that are on-going, or a priority for us to implement after approval of this CCP, are discussed under "Actions Common to All of the Alternatives" above. Other desirable research projects are identified as strategies under objectives statements.

Surveying vegetation on the refuge

Paul Casey/USFWS

We describe the Service's support for an LMRD area to represent the Northern Forest ecosystem in chapter 1 under the Goals discussion. In summary, LMRD areas were envisioned "…to facilitate development, testing, teaching, publishing, and demonstration of state-of-the-art management techniques that support the critical habitat management

information needs for fish, wildlife, and plant conservation within the System and other lands"(USFWS 1999).

Lake Umbagog Refuge, in partnership with the Nulhegan Division of the Silvio O. Conte Fish and Wildlife Refuge, and the Moosehorn Refuge, developed a proposal to be included in the LMRD program. It was one of 13 LMRD proposals approved at the national level. Through this LMRD program and our partners, as explained in Goal 6, we would be able to expand the contribution we are making to the focal species in this alternative by exporting our forest management techniques to proposed easement lands as well as private and public lands beyond our conservation proposal. Currently, we do not have funding for this program. Our objectives below outline a course of action to establish an LMRD program on this refuge.

Strategies
In addition to the strategies under "Actions Common to all of the Alternatives" affecting this program:

Within 5 years of CCP approval:

- Hire an LMRD coordinator with sufficient project funding and integrate with existing refuge staff, who will work with partners to: a) establish and prioritize forest research needs; b) facilitate forest management research on Northern Forest public and private lands; c) coordinate the exchange of research results among Northern Forest landowners; d) publish research findings in peer-reviewed publications

- Conduct a research needs assessment for the refuge; emphasize research projects that evaluate our assumptions, objectives, strategies, and techniques on focal species management

Within 5-10 years of CCP approval:

- Develop a mission and framework for a research program, including research criteria, protocol, and approval for activities on refuge lands

- Facilitate priority research and publish findings in peer-reviewed publications; all research products, including presentations, posters, and/or journal articles done by others will acknowledge the role of the Service, refuge staff and/or Refuge System lands, as appropriate, as key partners in the research effort.

Objective 7.2 (Outreach for Research and Applied Management Program)
Demonstrate habitat management techniques to partners, the scientific community, and the public to promote conservation of wildlife in the Northern Forest. Distribute findings regularly through various media.

Rationale
Same as objective 7.1 under alternative B

Strategies
Within 5-10 years of CCP approval:

- Facilitate demonstration areas on both refuge, and other ownerships, that showcase habitat management techniques for species of concern in the Northern Forest.

- Cooperate with the Partners for Wildlife Program to accomplish outreach and applied management activities; coordinate with their staff, and funding sources

- Provide forums to present and discuss research findings
- Conduct a series of workshops and courses
- Develop a website for others to access research findings; publish findings

Alternative C. Management to Create Natural Landscape Composition, Patterns, and Processes

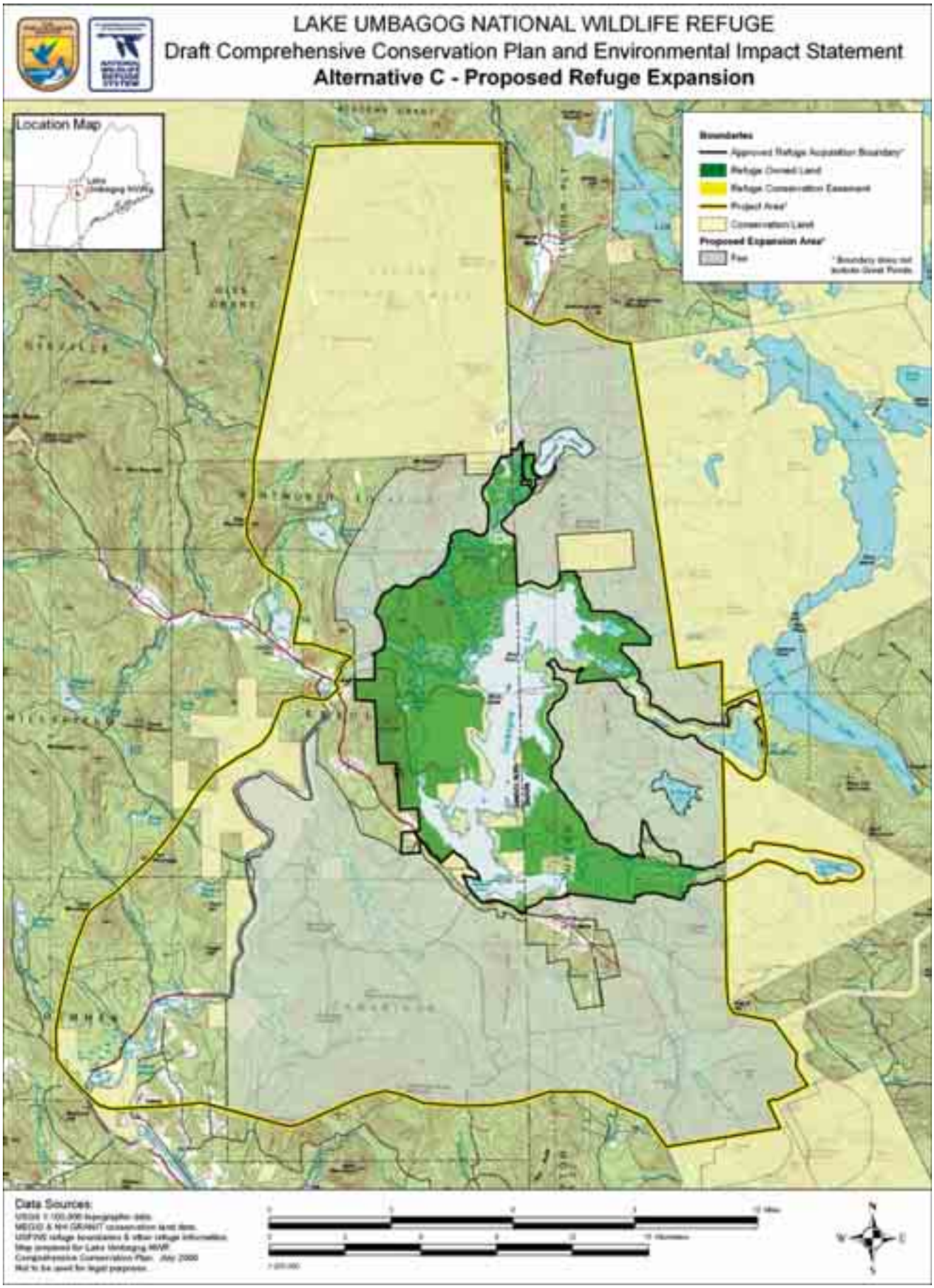
Introduction

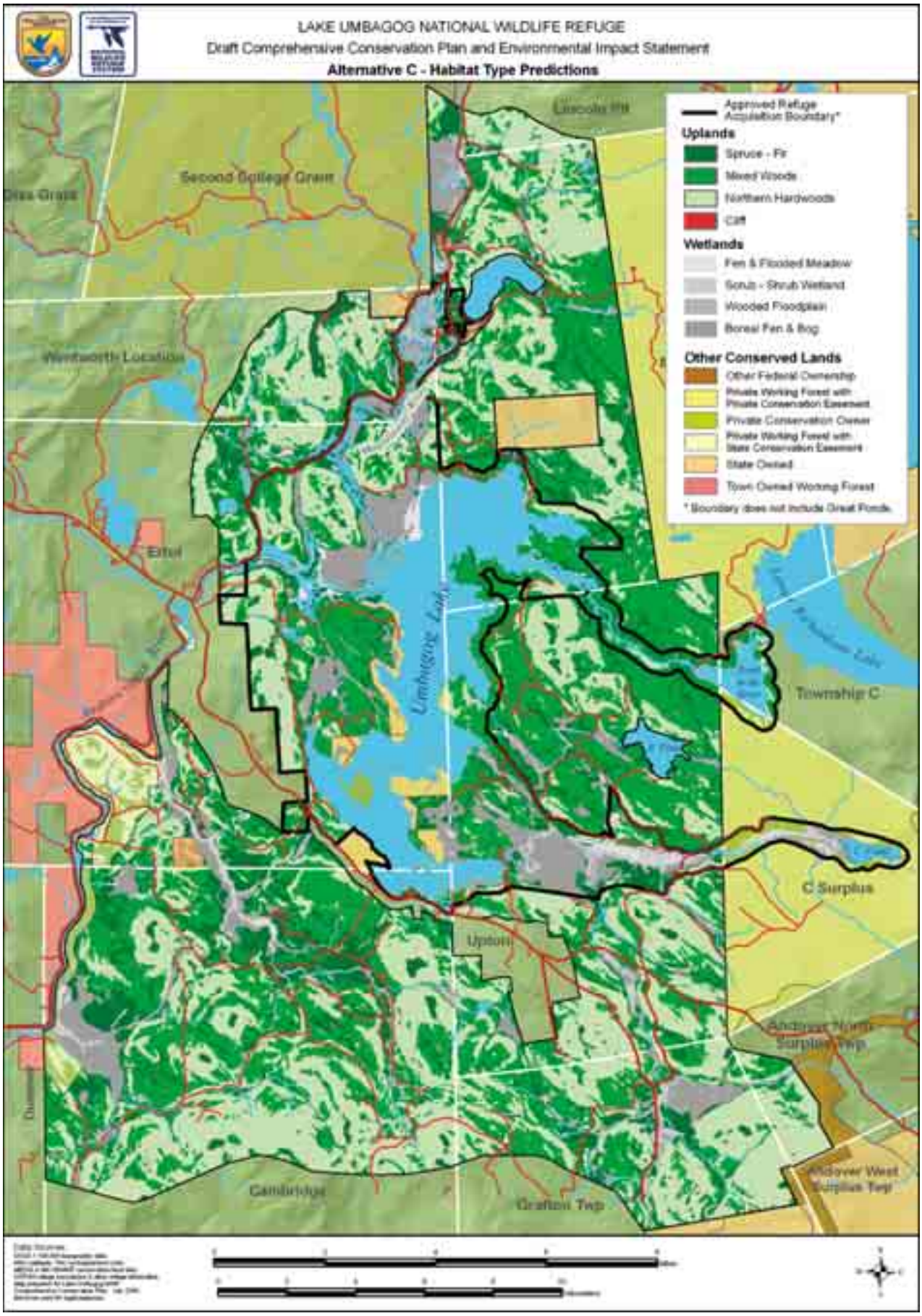
This alternative strives to establish and maintain the ecological integrity of natural communities within the refuge and surrounding landscape in the Upper Androscoggin watershed. Ecological integrity is defined by having all native species present, ecological processes and natural disturbance events, occurring, within their respective distribution, abundance or frequency, and natural range of variability, characteristic of that community type under natural conditions. A natural community with high integrity is also defined as being resilient and able to recover from severe disturbance events (Roe and Ruesink 2004). Management under alternative C would range from passive, or "letting nature take its course," to actively manipulating vegetation to create, or hasten the development of, mature forest structural conditions shaped by natural disturbances. No particular wildlife species are a focus of management.

As a priority, we would implement studies, consult experts, and conduct literature reviews, to further refine our knowledge of disturbance patterns and structural conditions in both wetlands and uplands natural communities. Under alternative C, we would continue to recognize the current FERC license; however, we would also discuss with the licensee opportunities to manage at water levels that mimic a more natural hydrologic flow throughout the year. Our wetland management would also pursue restoration projects where past land uses hinder natural hydrological flow and wetlands development.

In refuge uplands, we would manage to restore the forest communities predicted as the "potential natural vegetation," using both Kuchler's delineations of types and ELU's , as the basis to determine which types are best -suited and most capable of growing on these sites (Kuchler 1964; Anderson 1999). Our management would be designed to create similar mature stand structural conditions that would be expected from natural disturbance events which shaped the Northern Forest landscape. These disturbance events include hurricanes, flooding, ice storms, and small blow-downs. We would manage forest age-class, species, and diameter distribution, understory development, amount of dead and dying and cavity trees, large and old trees, coarse woody debris, and canopy closure indicated by historic accounts and/or as described by experts. Notwithstanding these actions, we would also ensure protection of current or future threatened and endangered species, and control the establishment and spread of any non-native, invasive species. Introduced pests and pathogens, including beech-scale disease, gypsy moth, and hemlock and balsam wooly adelgid, may present management issues in the future that require intervention. Map 2-11 depicts the broad habitat types we predict would result after approximately 150 years of implementing alternative C management objectives.

The proposed refuge expansion of 76,304 acres is essential to the success of alternative C (map 2-10). Experts have suggested that 25,000 contiguous acres, connected hydrologically and in a relatively undisturbed condition, is a reasonable approximation of the minimum size within which ecological processes, structure and function, and including the disturbance events identified above, could occur naturally (Anderson 1999; Roe and Ruesink 2004). As such, our expansion proposal under alternative C is designed to protect and conserve large, contiguous habitat blocks exceeding 25,000 acres and connecting them to


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Alternative C - Proposed Refuge Expansion
Location Map
Boundaries
Approved Refuge Acquisition Boundary*
Refuge Owned Land
Refuge Conservation Easement
Project Area*
Conservation Land
Proposed Expansion Area*
Fee
Data Sources:


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Alternative C - Habitat Type Predictions
Approved Refuge Acquisition Boundary*
Uplands
Spruce - Fir
Mixed Woods
Northern Hardwoods
Cliff
Wetlands
Fen & Flooded Meadow
Scrub - Shrub Wetland
Wooded Floodplain
Boreal Fen & Bog
Other Conserved Lands
Other Federal Ownership
Private Working Forest with Private Conservation Easement
Private Conservation Owner
Private Working Forest with State Conservation Easement
State Owned
Town Owned Working Forest
* Boundary does not include Great Ponds.
Second College Grant
Wentworth Location
Errol
Umbagog Lake
Township C
C Surplus
Upton
Cambridge
Grafton Twp

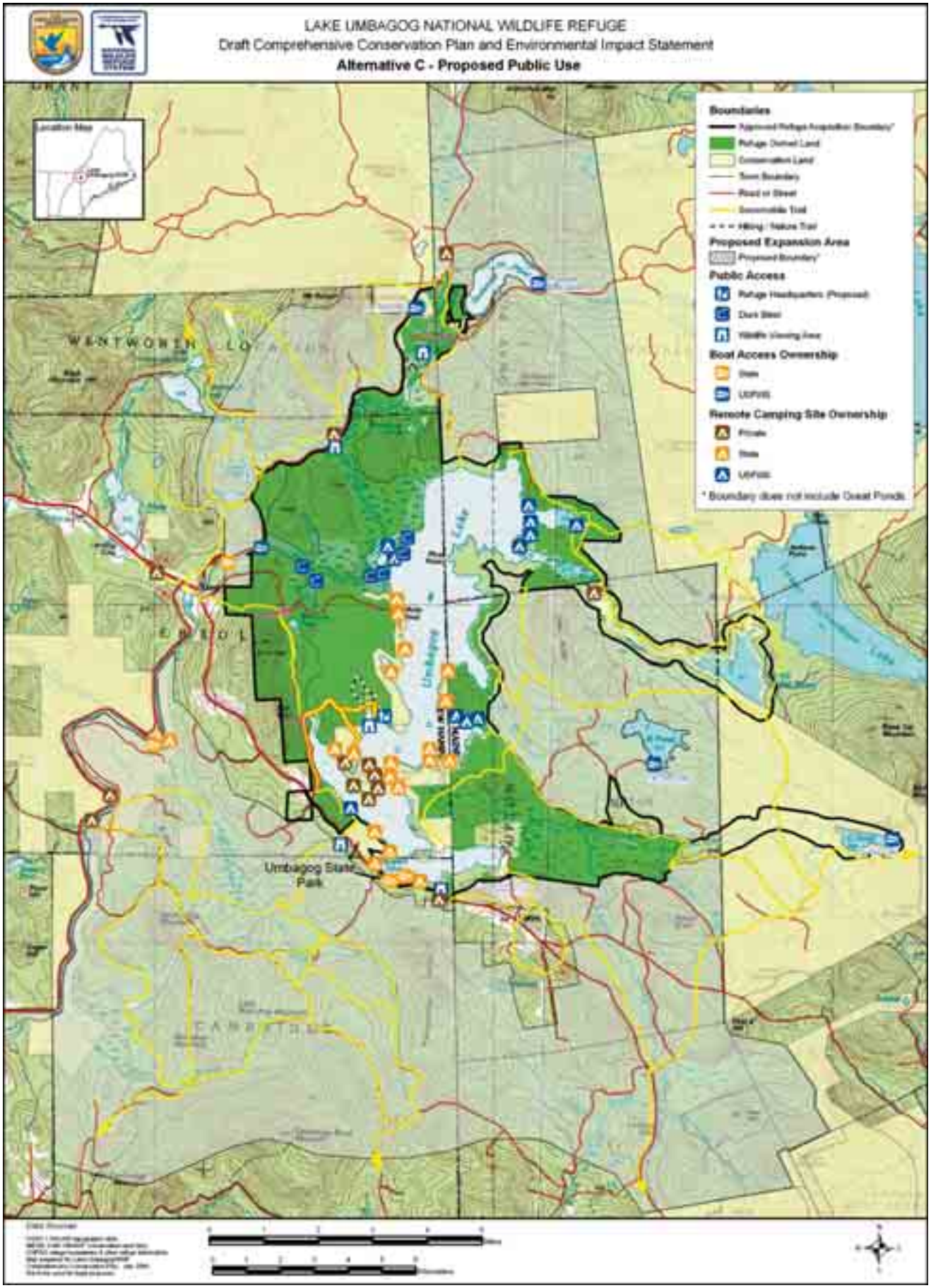
other conserved lands. Unlike alternative B, our need for adjacent conservation landowners to work cooperatively and complement our management is less important because the extent of lands we propose to acquire would allow us to meet our objectives independent of adjacent lands. All 76,304 acres identified would be acquired from willing sellers in fee simple by the Service. Fee simple acquisition ensures full management control and flexibility. As we acquire these lands, we would manage them by the goals, objectives, and strategies under this alternative.

Compared to the alternative B proposals for visitor services programs and refuge uses, alternative C would limit new infrastructure for wildlife observation, photography, and interpretation to those around the Potter Farm facility and roadside pullouts along Routes 16 and 26; however, it would similarly enhance the existing opportunities for hunting and fishing (map 2-12). It would also open up the refuge to furbearer trapping under permit, although unlike alternative B, the program would emphasize natural furbearer population dynamics. Like alternative B, remote camping on the existing designated lake sites would continue to be allowed, although we would increase monitoring of individual sites, and rehabilitate, or close permanently or seasonally those in need of restoration.

Also similar to alternative B, under alternative C, we would enhance local community outreach and partnerships, continue to support a Friends Group, and provide valuable volunteer experiences. We would also pursue the establishment of a LMRD site on the refuge to promote research, and the development of applied management practices, to sustain and enhance the natural composition, patterns and processes within their range of natural in the Northern Forest.

Refuge forest, fen and flooded meadow, and open water habitats on the refuge

Bill Zinni/USFWS


LAKE UMBAGOG NATIONAL WILDLIFE REFUGE
Draft Comprehensive Conservation Plan and Environmental Impact Statement
Alternative C - Proposed Public Use
Location Map
Boundaries
Proposed Expansion Area
Public Access
Boat Access Ownership
Remote Camping Site Ownership
* Boundary does not include Great Ponds.
WENTWORTH
Umbagog
Umbagog State Park

Goal 1 Manage open water and wetlands to benefit Federal trust species and other species of conservation concern.

Objective 1.1 (Fen and Flooded Meadow)
Manage 772 acres of fen and flooded meadow on Service-owned lands, within the current and expanded refuge boundaries, to reflect the composition, function and diversity of these wetlands as they would occur under natural environmental influences.

Rationale
Dan Sperduto and Bill Nichols of the NHNHI surveyed peatlands in the Umbagog area in 1998 and reported the peatlands in and around the refuge to be among the state's largest and most diverse. The fen and flooded meadows of Leonard Marsh and Harper's Meadow form an extensive acidic fen complex. These marshes and peatlands support a diverse array of waterfowl, marsh birds, shorebirds, songbirds, and amphibians as well as rare plants. Bird species associated with shrubby swamps and bogs include palm warbler, olive-sided flycatcher, yellow-bellied flycatcher, Nashville warbler, black-backed woodpecker, and rusty blackbird among others. These natural communities and associated plants and animals have developed over the past several hundred years following the damming of the Androscoggin River and concomitant water level changes.

As in the other alternatives, under alternative C we would conduct an ecological systems analysis to create an historical profile of Umbagog Lake and associated wetlands processes and succession. This would help provide a strong foundation for managing the wetlands within a natural range of variability, and within the context of an impounded system.

Strategies
In addition to objective 1.1 strategies under alternative A,

Within 5 years of CCP approval:
- Conduct a literature review of historical wetland distribution, vegetative composition, and bird communities to establish a benchmark of natural environmental influences. Manage to attain this historical distribution and composition where feasible and reasonable

Within 5-10 years of CCP approval:
- Remove roads, culverts, and any other obstructions that affect natural wetlands development, or interfere with natural hydrologic flow, unless human health or safety would be compromised.

- Determine the area of influence around wetlands (e.g. the area affecting flow and nutrient input) and define an ecological protection boundary within which no degradation of wetlands would occur

- Acquire 217 acres of this habitat type in fee simple, from willing sellers, and manage as described in the objective 1.1 under alternative C.

Within 10-15 years of CCP approval:
- Open discussions with hydropower facility owner/operator to discuss the feasibility of managing water levels, within the limits of the FERC license, to mimic a more natural hydrologic flow throughout the year.

Objective 1.2 (Boreal Fen and Bog)
Manage 4,615 acres of boreal fen and bog on Service-owned lands, within the current and expanded refuge, boundaries to reflect the composition, function and diversity of these peatlands as they would occur under natural environmental influences.

Rationale
Same as objective 1.1 immediately above; also see objective 1.2 under alternative B.

Strategies
In addition to objective 1.2 strategies under alternative B,

Within 5 years of CCP approval:
- Implement a peat coring study to determine the age of these peatlands and whether peat accumulation rates have changed over time.

Within 5-10 years of CCP approval:
- Conduct pollen analysis of peat cores to study changes in forest composition around the peatlands over time.

- Acquire 3,334 of this habitat type in fee simple, from willing sellers, and manage as described in objective 1.2 under alternative C.

Objective 1.3 (Northern White Cedar)
Manage 1,031 acres of northern white cedar forest on Service-owned lands, within the current and expanded refuge boundaries, to reflect the composition, function and diversity of this habitat type as it would occur under natural environmental influences.

Rationale
Northern white cedar swamps have the highest plant species diversity of any of the refuge's plant community types. The largest northern white cedar swamp in New Hampshire occurs north of Whaleback Ponds and is also found in the Mountain Pond drainage and the Dead Cambridge River. Sperduto and Nichols (2004) provide a detailed description of the plant species associates and ecological conditions typical of a northern white cedar swamp with the Umbagog Lake vicinity offering good examples. Northern white cedar is a long-lived species with individual trees over 100 years old. Magnolia warbler, red-eyed vireo, olive-sided flycatcher, Swainson's thrush, winter wren, and Canada warbler are some of the bird species found in this habitat. Northern white cedar swamps provide important winter cover and food source (as evidenced by browsing) for white-tailed deer. Beaver are often present in these swamps that are associated with perennial streams playing an important role in the natural disturbance regime (Thompson and Sorenson 2000).

As mentioned under alternative B, there are likely scattered stands of this habitat type in the expansion area, but it was not discernable in the datasets we used for vegetation mapping. If this type is acquired by the Service in fee, it would be managed as stated under this objective.

Strategies
In addition to objective 1.3 strategies under alternative A,

Within 5 years of CCP approval:
- Consult experts and literature to determine what natural disturbances historically shaped the structure, composition, and regeneration of this cover type

Within 5-10 years of CCP approval:
- Evaluate land use changes and management actions (e.g., timber harvest) to determine how they might have affected the natural development of this habitat type on the refuge

- Establish management boundaries based on soil conditions, wetness, and topography to be able to effectively manage these sensitive cover types using best management practices developed by states; evaluate and quantify appropriate protective buffer widths and their effectiveness over time

- Work closely with state non-game and natural heritage programs to conduct more detailed surveys of rare plant and animal occurrences in, and the overall condition, of this cover type

Objective 1.4 (Scrub-Shrub Wetland)
Manage 1,976 acres of scrub-shrub wetlands on Service-owned lands, within the current and expanded refuge boundaries, to reflect the composition, function and diversity of these wetlands as they would occur under natural environmental influences.

Rationale
The alder shrubland is found on mineral soils along stream floodplains that experience overbank flooding with shrubs dominating the vegetation community (70% or more). The most extensive areas are found in the Dead Cambridge River floodplain. Similar scrub-shrub wetland communities include speckled alder swamp and speckled alder peatland lagg—alder swamps on peat or muck substrate that are not influenced by alluvial processes (i.e., river flooding). The sweetgale mixed shrub thicket occurs in lakeshores, beaver meadows, and fens (Rapp 2003).

Shrubland communities that are affected by periodic flooding typically persist for long periods, perhaps decades or centuries, without some other major disturbance. Alder swamps without flooding influences may succeed to forest wetlands in relatively short periods (Thompson and Sorenson 2000). Beaver can play a role in maintaining the shrubby conditions as well. These scrub-shrub wetlands provide breeding and/or foraging habitat for alder flycatcher, common yellowthroat, yellow warbler, swamp sparrow, catbird, veery, and American woodcock and year round habitat for wood turtle, river otter, mink, muskrat, and beaver.

Strategies
In addition to objective 1.4 strategies under alternative A:

Within 5 years of CCP approval:
- Manage to encourage the natural role of beaver in maintaining this wetland type; sustain numbers comparable to those within the natural, historic range of density found in suitable habitat in northern New Hampshire and Maine.

Within 10-15 years of CCP approval:
- Acquire 1,077 acres of this habitat type in fee simple from willing sellers, and manage as described in objective 1.4

Objective 1.5 (Open Water)
In partnership with the states of Maine and New Hampshire, manage an estimated 5,934 acres of open water on Service-owned lands, within the current and expanded refuge boundaries, to maintain a healthy aquatic system, including native species diversity, consistent with the results of the wetlands system analysis.

Rationale
Same as objective 1.5 under alternative B

Strategies
In addition to the strategies under "Actions Common to all of the Alternatives" affecting this program:

Within 5 years of CCP approval:
- Map and monitor native mussel beds.

Within 5-10 years of CCP approval:
- Monitor water quality, chemistry, and water levels for potential effects on aquatic vegetation, fish, and waterfowl.
- Evaluate macro-invertebrates and fishery resources.
- Acquire an estimated 100 acres of this habitat type in fee simple from willing sellers, and manage as described in objective 1.5

Within 10-15 years of CCP approval:
- Implement actions, where practical, that would re-establish or maintain naturally sustainable native fish and aquatic plant species; utilize Umbagog Lake Working Group partnership to identify which resources would be a priority
- Evaluate point and non-point sources of pollution in the entire Upper Androscoggin Watershed and work with private, State, and local entities to improve water quality.

Objective 1.6 (Common Loon)
Manage wetlands according to objective 1.1 under alternative C, with no particular emphasis on enhancing habitats specifically for common loon, except to protect active nesting sites from human disturbance.

Strategies
Same as objective 1.6 under alternative A

Goal 2 Manage floodplain and lakeshore habitats to benefit Federal trust species and other species of conservation concern.

Objective 2.1 (Wooded Floodplain)
Manage 1,433 acres of wooded floodplain on Service-owned lands, within the current and expanded refuge boundaries, to reflect the composition, function and diversity of these habitats as they would occur under natural environmental influences.

Rationale
Sperduto and Nichols (2004) highlight the balsam fir floodplain along the Magalloway River as a good example of this S2 community type. Red maple floodplain forest, currently described as a more southern community type, occurs over an extensive area along the Magalloway River (Rapp 2003). These riparian ecosystems are areas with high species richness with dynamic and complex biophysical processes. Cavity nesting birds, waterfowl with broods, a diverse amphibian community, and roosting and foraging bats are among the wildlife community that utilizes the wooded floodplain.

Wooded floodplains throughout the region are heavily impacted by agriculture and development, making the Umbagog area floodplains of particular importance to maintaining biological diversity. A priority of the refuge under this alternative

Ian Drew/USFWS

Lakeshore pine-hemlock forest along the Androscoggin River

is to restore the developed floodplain following removal of cabins and other structures.

Disturbance is an essential and regular dynamic within wooded floodplains. This feature also makes them particularly vulnerable to non-native invasive plants that thrive in disturbed areas. Exposed soils offer prime sites for invasive species to colonize and spread. Although not yet documented on the refuge, floodplain forests in other areas are particularly affected by several invasive plant species including garlic mustard, common buckthorn, ground-ivy, European bush honeysuckle, Tartarian honeysuckle, moneywort, and Japanese knotweed (Thompson and Sorenson 2000). If any of these species become established, the refuge may need to intervene with control measures to maintain the ecological integrity of the floodplain ecosystem.

The refuge currently owns, or has approval for, 1,293 acres of this habitat type. The alternative C expansion proposal includes Service acquisition in fee simple ownership of an additional 140 acres of this habitat type. Fee ownership allows for full management capability on these lands.

Strategies
In addition to objective 2.1 strategies under alternative A,

Within 5 years of CCP approval:

- Assess floodplain community ecology and dynamics to conserve the natural range of variability in species, density, distribution, and diameter of standing snags, downed woody debris and live riparian trees. Create standing snags and downed logs, and manage live vegetation, as warranted. While active management may be required within the next 15 years to establish some minimum structural or composition thresholds, ultimately, the objective is to create a habitat complex that is sustained by natural processes.

Within 5-10 years of CCP approval:

- Restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas, assuming that preliminary site surveys determine that invasive plants would not be a threat

- Acquire 140 acres of this habitat type in fee simple, within the expansion area, from willing sellers, and manage as described in the objective 2.1 and to preclude development and maintain flood control and storage capabilities.

Objective 2.2 (Lakeshore Pine-Hemlock)
Manage 520 acres of lakeshore pine-hemlock on Service-owned lands, within the current and expanded refuge boundaries, to more closely reflect the composition, function, and diversity of this habitat as it would occur under natural environmental influences.

Rationale
Same as objective 2.2 under alternative B

As mentioned under alternative B, there are likely scattered stands of this habitat type in the expansion area, but it was not discernable in the datasets

we used for vegetation mapping. If this type is acquired by the Service in fee, it would be managed as stated under this objective.

Strategies
In addition to objective 2.2 strategies under alternative A,

Within 5 years of CCP approval:
- Develop and implement a habitat management plan to perpetuate this habitat type, giving priority to water quality protection and aesthetic values.

Within 5-10 years of CCP approval:
- Allow windthrow events to occur. No salvage harvest to occur after these events.

Objective 2.3 (Bald Eagle and Osprey)
Same as objective 2.3 under alternative B

Goal 3 Manage upland forested habitats, consistent with site capabilities, to benefit Federal trust species and other species of conservation concern.

Objective 3.1 (Mixed Spruce-Fir/Northern Hardwoods Forest Matrix)
Conserve the mixed forest matrix, by managing 3 dominant forest habitat types: spruce-fir (approximately 14,406 acres); conifer-hardwoods mixed woods (approximately 34,515 acres; and, northern hardwoods (approximately 36,375 acres) on Service-owned lands within the current and expanded refuge boundaries, in ≥25,000 acre contiguous, unfragmented blocks. Create a mosaic of forested stands in a mix of age, composition, and structure that would occur under natural environmental influences.

Rationale
As we described under alternative B, goal 3, the forest matrix in the Upper Androscoggin River watershed was historically, and is currently, an overall mixed spruce-fir/northern hardwoods forest. We also mentioned that there are 3 habitat types embedded within this mixed forest matrix. We describe these habitat types in more detail below.

The refuge currently owns, or has approval to acquire, 13,874 acres of mixed forest matrix, composed of the 3 habitat types. Under the alternative B expansion proposal, we recommend Service fee simple acquisition of an additional 71,416 acres of the mixed forest matrix. Fee acquisition would allow for full management capability on these lands.

Spruce-Fir Habitat Type
Red spruce and balsam fir are the late successional dominant tree species in the lowland spruce-fir habitat type. Species composition varies depending on soil conditions; black spruce is common on wetter soils and white pine is often a component of the canopy on dryer soils. Hardwoods such as red maple, yellow birch, and paper birch can be mixed in as well, and white spruce is common in some areas. Overall plant diversity in lowland spruce-fir forests is low compared to other forest types. Shrubs such as mountain holly and wild raisin are scattered in the understory, while mosses and liverworts often dominate the ground layer. Scattered patches of herbs such as common wood sorrel, bluebead lily, and shining clubmoss persist in dense shade on the forest floor (Roe and Ruesink 2004).

Insect outbreaks are the most frequent and influential natural disturbance in lowland spruce-fir habitat type. Pests such as spruce budworm and spruce bark

beetle occur in 50 to 100 year cycles, creating large patches of dead and dying trees up to 2,500 acres in area. Wind and fire also affect these forests, with wind the more important of the two. Red spruce tends to experience a long disturbance cycle of 200 or more years, which is driven by wind, fire, or insects. Balsam fir stands cycle at an interval of roughly 75 years primarily in response to insect outbreaks. The canopy is not continuous; lowland spruce-fir forests tend to have a moth-eaten appearance, with a coarse-grained uneven mosaic of medium and large patches (25 to 2,500 acres in size) in a patchwork of multi-cohort stands (Roe and Ruesink 2004). Lorimer (1977) estimated that pre-settlement spruce-fir forests in Maine supported about 2 percent recently disturbed stands (0-10 years old) and 60 percent older aged stands (>150 years).

Lowland spruce-fir forest is a common community type on the refuge, forming large stands in lower elevation areas on gentle slopes and flats, although logging disturbed much of the habitat. The largest remaining stands are in the Mountain Pond and Sunday Cove areas as well as in the Whaleback Ponds, Mile Long West, and Dead Cambridge areas. Other spruce-fir types include black spruce-red spruce forest such as the area near Sunday Cove and the moose wallow 1.5 miles northeast of the refuge headquarters. Red spruce-rocky summit occurs on ridge tops and steep, rocky slopes in the Errol Hill, Mile Long, and Whaleback Pond areas (Rapp 2003).

The New Hampshire Forest Resources Plan noted declines in mature spruce fir forests and concluded that this habitat type supports more rare animal species in New Hampshire than other major forest types (New Hampshire Division of Forests and Lands 1995). Bird species associated with this habitat type include boreal chickadee, magnolia and blackburnian warblers, yellow-bellied flycatcher, purple finch, red crossbill, spruce grouse, pine grosbeak, gray jay, and black-backed and three-toed woodpeckers. Several of these species' populations fluctuate with spruce budworm outbreaks. Although spruce budworm was present in pre-settlement forests, the frequency and intensity of outbreaks is unknown, with some evidence that budworm was not a major disturbance factor until the early 1800s and now occurring on shorter cycles (Lorimer 1977; Charlie Cogbill, personal communication, 2004). Black-backed and three-toed woodpeckers specialize on wood-boring insects in spruce and fir while magnolia warbler and yellow-bellied woodpecker inhabit young spruce-fir stands.

Mixed Woods Habitat Type

Red spruce-northern hardwood or mixed woods occurs on shallow soils or those with a hardpan that creates moist soils conditions. Mean gap size tends to be larger than in northern hardwoods, as the shallow, moist soils make it more likely that small groups of softwoods topple to the ground. Small, frequent gaps may range up to 0.5 acres in size. Several long-lived tree species – especially red spruce and hemlock – that can live for 400 to 500 years are abundant in these forests. Currently, natural species composition is significantly altered on many sites that should support a spruce/fir-northern hardwood forest. According to historical records, red maple was an uncommon tree in pre-settlement forests, yet it is common in mixed forests today. Current conditions, such as low soil pH, high soil aluminum concentrations, and selective removal of softwood species on moist sites, appear to favor red maple germination and growth. In addition, previous logging activities have reduced softwood abundance below natural levels on many sites (Roe and Ruesink 2004).

Northern Hardwood Habitat Type

Northern hardwood forests, dominated by American beech, yellow birch, and sugar maple, occur at elevations less than 2,700 feet. Striped maple, hobblebush, and shadbush are common understory shrubs. Tree fall gaps are dispersed and frequent. Moderate-sized blow downs occur at 25-year intervals, while large

stand-replacing disturbances occur at 500 to 1,000 year intervals. Fires and pathogens are not significant factors in northern hardwood forests. Natural conditions within northern hardwood forests include an all-aged structure, trees 150-200 years old on average, the oldest trees reaching 300 years, and less than 1% of the canopy disturbed annually by tree mortality (Roe and Ruesink 2004).

Overall, most northern hardwood forests currently under management would need a long "recovery" period to create all-aged stands that include trees in the oldest age classes. Any restoration silviculture should use small and dispersed single-tree and small group selection cuts with no canopy openings greater than 0.25 acres. This will lead to a very fine-grained, all-aged condition. Large legacy trees and other structural elements, such as large standing and downed dead wood, should be retained. Median canopy tree age should be approximately 150 years, and stands should include mature trees that are 300+ years old (Roe and Ruesink 2004).

Strategies
In addition to objective 3.1 strategies under alternative A,

Specific Strategies for the Spruce-Fir Habitat Type
Within 5 years of CCP approval:
- Identify and protect biological legacies such as large diameter dead and dying trees.

Within 5-10 years of CCP approval:
- Develop recently disturbed stands with only young spruce and fir under a canopy of aspen and white birch.
- Acquire 7,936 acres of this habitat type within the expansion area, from willing sellers, and manage as described in the objective 3.1.
- Across refuge, develop multi-cohort stands with scattered canopy red spruce >150 yrs old and an understory of spruce and fir up to 75 yrs old (Roe and Ruesink 2004).
- Develop multi-cohort stands with canopy red spruce 75-150 yrs old.

Specific Strategies for the Mixed Woods Habitat Type
Within 5-10 years of CCP approval:
- Increase the softwood component to approach the natural range of variation of the mixed cover type by using small group selection on up to 0.5 acres (Roe and Ruesink 2004).

Within 10-15 years of CCP approval:
- Acquire 32,813 acres of this habitat type from willing sellers, and manage as described in objective 3.1.

Specific Strategies for the Northern Hardwood Habitat Type
Within 5 years of CCP approval:
- Identify and protect biological legacies such as large-diameter coarse woody debris and standing snags.

Within 5-10 years of CCP approval:
- Promote natural tree species composition and reproduction.
- Promote natural, all-aged stand structure.

Within 10-15 years of CCP approval:

- Acquire 30,667 acres of this cover type from willing sellers, and manage as described in the objective 3.1.

Goal 4 Provide high quality wildlife-dependent activities such as hunting, fishing, wildlife observation, and photography

Objective 4.1 (Hunting)
Within 3 years of CCP approval, create a high-quality hunt program (as defined by alternative B), that is designed for a backcountry, remote, low density and with generally unimproved access.

Strategies
Same as objective 4.1 strategies under alternative B, except:

Within 5 years of CCP approval:

- Limit access; no developments or facilities; no improved access, emphasis is on a back-country experience. Much is walk-in only

Within 5-10 years of CCP approval:

- Consider a permit system and designated hunt areas once quality of hunt is affected by numbers and/or distribution or the ability to achieve refuge resource objectives are compromised

Objective 4.2 (Fishing)
Within 15 years of CCP approval, provide an angler experience that is remote, low density, and generally, with unimproved access. On the Rapid and Dead Cambridge rivers, the angling experience would be based on a native brook trout fishery.

Strategies
Same as objective 4.2 strategies under alternative B, except:

Within 5 years of CCP approval:

- Limit access; no developments or facilities; no improved access

Within 5-10 years of CCP approval:

- Consider a permit system and designated fishing areas once quality of angling experience is affected by numbers and/or distribution or the ability to achieve refuge resource objectives are compromised

Objective 4.3 (Wildlife Observation and Photography)
Same as objective 4.3 under alternative B

Strategies
Same as objective 4.3 under alternative B, except:

Within 5 years of CCP approval:

- No new infrastructure except near visitor contact facility, wildlife viewing pull-outs along Routes 16 and 26, and we would complete Magalloway River Trail expansion

- Establish restrictions on access to sensitive, easily impacted areas such the unique fens and bogs

Objective 4.4 (Camping on Umbagog Lake)
Same as objective 4.4 under alternative B

Strategies
Similar to objective 4.4 strategies under alternative B, except:

Within 5 years of CCP approval:
- Infrastructure at sites will be reduced to a low impact, leave-no-trace program, requiring campers to bring portable toilets, and no fires will be allowed.

Objective 4.5 (Boating)
Within 4 years of CCP approval, at least 80% of boaters passing through the refuge will report they had a high quality experience based on the following criteria: a) backcountry boating experience b) few contacts with other users; c) a positive, personally-challenging experience; and d) a reasonable chance to view wildlife in a natural setting.

Strategies
In addition to objective 4.6 strategies under alternative A,

Within 5 years of CCP approval:
- Limit interpretive tours by staff, volunteers, or partners, especially those that involve large groups > 20

Within 5-10 years of CCP approval:
- Limit boat access to canoe and kayaks only; car-top launching only from refuge lands; acquire other boat accesses

Goal 5 Develop high quality interpretative opportunities, and facilitate environmental education, to promote an understanding and appreciation for the conservation of fish and wildlife and their habitats, as well as the role of the refuge in the Northern Forest.

Objective 5.1 (Interpretative Programs: on-refuge emphasis)
Every year, at least 80% of visitors attending refuge interpretive programs will be able to identify one of the following: 1) be able to identify the refuge's purposes and describe its role in conserving the Northern Forest, 2) identify at least one community type and its associated species, 3) identify how natural and human processes have altered the landscape over time.

Strategies
Same as objective 5.1 strategies under alternative B, except limit new developments to:

Within 10-15 years of CCP approval:
- Develop an interpretive trail at the Potter Farm once the refuge headquarters is constructed; make it ADA compliant to the extent feasible. With the exception of new wildlife viewing pullouts, no other new facilities would be constructed

Objective 5.2 (Community Outreach)
Same as objective 5.2 strategies under alternative B

Strategies
Same as alternative B, except:

Within 5 years of CCP approval:
- Expand activities to include more activities off-site since fewer facilities on refuge.

Objective 5.3 (Visitor Awareness)
Same as objective 5.3 under alternative B

Strategies
Within 5-10 years of CCP approval:

- Develop an access management plan working with States and other partners providing public access to Umbagog Lake; establish thresholds of acceptable change which restriction would occur. Emphasis in uplands will be dispersed, back-country recreational opportunities, with limited developments (e.g. Trails and roads).

Objective 5.4 (Environmental Educational Opportunities)
Facilitate environmental education opportunities on the refuge, in partnership with other educators, to explain the importance of conserving and managing the natural resources in the Northern Forest to students, teachers, and other visitors. All who participate in environmental education programs on the refuge will be able to 1) understand the need for migratory bird conservation; 2) understand the role of natural processes in the development of the forest ecosystem; 3) identify the refuge's role in the Refuge System and in conserving the Northern Forest; and, 4) name at least one natural community type in the Northern Forest.

Strategies
Same as objective 5.4 strategies under alternative B

Goal 6 Enhance the conservation and management of fish and wildlife resources in the Northern Forest Region through partnerships with public and private conservation groups, private landowners, State and local entities.

Objective 6.1 (Partnerships)
Same as objective 6.1 under alternative B

Goal 7 Develop Umbagog National Wildlife Refuge as an outstanding center for research and development of applied management practices to sustain and enhance the natural resources in the Northern Forest in concert with the Refuge System Land Management Research Demonstration (LMRD) program.

Studying bald eagles on the refuge

Ian Drew/USFWS

Objective 7.1 (Research and Applied Management)
Same as objective 7.1 under alternative B except:

The focus of research and applied management would be on natural systems and ecological processes of the Northern Forest

Objective 7.2 (Outreach for Research and Applied Management Program)
Same as objective 7.2 under alternative B, except:

Demonstrate management techniques to partners, the scientific community, and public that enhance the natural diversity and promote natural ecological processes of the Northern Forest.

Summary Comparison of Management Actions by Alternative

Introduction

Chapter 2, Part III, "Actions Common to All the Alternatives" describes many important actions which are not discussed in the table below. Those actions include: developing refuge step-down plans, coordinating lake water level management, implementing and prioritizing a biological monitoring and inventory program, protecting deer winter yards, protecting vernal pools and other unique or rare communities, expanding and protecting the Floating Island National Natural Landmark, maintaining partnerships, permitting special uses, distributing refuge revenue sharing payments, conducting wilderness and wild and scenic rivers reviews, protecting cultural resources, and refuge staffing and administration. The reader is encouraged to review this section for a complete perspective on each alternative.

Table 2.2 highlights those actions that distinguish the alternatives, how they relate to our goals, and how they address the significant issues identified in chapter 1. Please refer to the glossary to interpret any acronyms.

Table 2.2. Highlights of respective alternative's actions as they relate to goals and significant issues

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 1. Manage open water and wetlands to benefit Federal trust species and other species of conservation concern			
Responds to Issues: Which wetlands habitats and dependent species should be a management priority? How will we manage for them on the refuge? How will we manage furbearer populations?			
Fen and Flooded Meadow; Boreal Fen and Bog	Continue "passive" management on 1,666 acres of these habitat types; we define passive management as protecting, monitoring key resources, and conducting baseline inventories to improve our knowledge of the ecosystem Continue spring and fall migratory waterfowl and shorebird surveys and breeding marsh bird surveys	In addition to alternative A: Actively manage to promote high quality habitat for focal species identified in objective 1.1 and 1.2 (e.g. various waterfowl, marsh and wading birds), to the extent possible under the existing FERC license Expand alternative A bird surveys to include nesting, brood-rearing and migrating waterfowl, shorebird and marsh wading birds Evaluate recreational impacts on waterfowl and water bird brood rearing in the Dead Cambridge River area	In addition to alternative A: Remove roads, culverts, and any other obstructions not needed for administrative purposes or priority programs, that affect natural wetlands development or interfere with natural hydrologic flow Determine historical distribution, composition, and development of wetlands prior to dam establishment and evaluate whether historical context can be reestablished

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 1. (cont'd) Manage open water and wetlands to benefit Federal trust species and other species of conservation concern			
Fen and Flooded Meadow; Boreal Fen and Bog (cont'd)	Conduct other baseline species and vegetation monitoring and inventories as funding allows, including in the 860 acre Floating Island NNL In cooperation with NPS, expand NNL boundary to include 2,181 total acres, and establish permanent monitoring program to insure no loss of diversity or integrity Continue to support research to determine impacts on resources of concern from water level management Continue to acquire up to 170 acres from willing sellers within current, approved boundary	Expand production of wild rice and other high energy food sources for waterfowl Determine a more favorable year round water level management regime for conserving priority habitats and focal species, including NNL, and initiate dialogue with the holder of the FERC license for the Errol Project (currently FPLE) to determine feasibility of implementation Conduct a hydrologic study of groundwater and nutrient flow in Leonard Marsh and Harpers Meadow In addition to alternative A acquisition, increase permanent conservation of these habitat types through Service acquisition in fee simple of 2,573 acres, and 358 acres in conservation easement; all acquisition would be from willing sellers	Determine an annual hydrologic flow that more closely mimics a natural regime, and initiate dialogue with the holder of the FERC license for the Errol Project (currently FPLE) to determine feasibility of implementation Increase permanent conservation of these habitat types through Service acquisition in fee simple of 3,551 acres; all acquisition would be from willing sellers
Northern White Cedar	Continue passive management on the 829 acres in this habitat type Continue to inventory small mammals and amphibians as funding allows Continue to acquire up to 202 acres from willing sellers within current, approved boundary	Expand alternative A surveys to include more detailed surveys of rare plant and animal occurrences; and, working with state Heritage Programs, establish measures of ecological integrity and develop a monitoring program to evaluate overall condition Restore northern white cedar on sites where land use converted it to another type; treat competing vegetation on up to 150 acres in 15 years Evaluate habitat needs of boreal species using this habitat type; manage to enhance those features, if not present	In addition to alternative A: Determine historical distribution, composition, and development of this habitat type prior to dam establishment and evaluate whether historical context can be reestablished In cooperation with state heritage programs, conduct baseline studies of rare plant and animal occurrences within this type, establish measures of ecological integrity and develop a monitoring program to evaluate overall condition

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 1. (cont'd) Manage open water and wetlands to benefit Federal trust species and other species of conservation concern			
Scrub-Shrub	Continue passive management on the 655 acres in this habitat type Continue to acquire up to 244 acres from willing sellers within current, approved boundary Continue to support research to determine impacts from water level management	In addition alternative A research: In woodcock focus areas which overlap this habitat type, identify treatment areas and actively enhance woodcock foraging and brood-rearing habitat by creating and maintaining alder on approximately 20-year rotations Facilitate beaver activity where practical and consistent with habitat objective. In addition to alternative A acquisition, increase permanent conservation of these habitat types through Service acquisition in fee simple of 842 acres, and 64 acres in conservation easement; all acquisition would be from willing sellers	In addition alternative A: Use beaver to sustain this habitat type; manage beaver populations within their historic, natural range of density/mile found in suitable habitat in northern NH and ME Increase permanent conservation of this habitat type through Service acquisition in fee simple of 1,077 acres; all acquisition would be from willing sellers
Open Water	Continue passive management on the 5,033 acres in this habitat type Continue to map distribution of SAV beds as funding allows Continue to acquire up to 801 acres from willing sellers within current, approved boundary	Work with states, to protect and enhance SAV beds, improve water quality, and increase production of native brook trout Map and monitor native mussel and SAV beds In addition to alternative A acquisition, increase permanent conservation of these habitat types through Service acquisition in fee simple of 46 acres, and 23 acres in conservation easement; all acquisition would be from willing sellers	In addition to alternative A: Establish water quality monitoring program, identify pollution sources in the Upper Androscoggin River watershed, and determine impacts on aquatic resources; Increase permanent conservation of this habitat types through Service acquisition in fee simple of 100 acres; all acquisition would be from willing sellers
Common Loon	Continue to monitor and actively protect loon nesting sites (e.g. restricted public access, buoy lines, nest observers and monitors, outreach and education) in partnership with states and with the holder of the FERC license for the Errol Project (currently FPLE) Continue annual meetings with FERC licensee or representative to advise on lake water level	In addition to alternative A, initiate surveys and studies to: Map and monitor recreational use and pressure near loon nesting territories Evaluate loon interactions with waterfowl during the breeding season and determine impact of predators in loon nesting success; manage loon predators as warranted Once study and inventory results available, review loon nesting carrying capacities identified in objective 1.6. Evaluate availability and quality of natural nesting sites	Same as alternative A

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 1. (cont'd) Manage open water and wetlands to benefit Federal trust species and other species of conservation concern			
Common Loon (cont'd)	management; continue to use breeding and nesting loons as bio-indicators of water-level management impacts Continue to support research into the decline of the local loon population; also, develop and maintain a permanent dataset at LPC and the refuge on this Umbagog Lake population		
Furbearer Management	No management	Manage beaver densities to enhance wetlands and scrub-shrub habitat; reintroduce them to areas, if practical. At refuge manager's discretion, use trapping as a furbearer management tool to achieve objectives; refuge lands would be open to trapping consistent with respective state regulations and seasons	Same as alternative B; although furbearer trapping less likely to be utilized under this scenario
Goal 2. Manage floodplain and lakeshore habitats to benefit Federal trust species and other species of conservation concern			
Responds to Issue: Which habitats and dependent species should be a management priority? How will we manage for them on the refuge?			
Wooded Floodplain	Continue passive management on the 1,140 acres in this habitat type Continue to restore natural vegetation on unauthorized camp sites and surplus cabins sites that have been removed Continue vernal pool, small mammal, amphibian and breeding bird surveys as funding allows	In addition alternative A: Actively manage to promote high quality habitat for focal species identified in objective 2.1 (northern parula and rusty blackbird); where practical, create those forest stand structural attributes determined to be a limiting factor for breeding and nesting focal species (e.g. cavity trees, rich understory) Protect/retain large legacy trees, and large standing and downed dead wood for cavity tree-dependent wildlife Restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas	In addition to alternative A: Determine historical distribution, composition, and development of this habitat type and evaluate whether historical context can be reestablished; management objective would be to create a habitat complex that would eventually be sustained through natural ecological processes without further intervention Restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 2. (cont'd) Manage floodplain and lakeshore habitats to benefit Federal trust species and other species of conservation concern			
Wooded Floodplain (cont"d)	Continue to acquire up to 153 acres from willing sellers within current, approved boundary	Work with NHNHB to define the rare Magalloway River floodplain type, and establish measures of ecological integrity; implement a monitoring program Evaluate isolated backwater areas with high potential for waterfowl brood rearing habitat to determine if seasonal boat access closures would enhance habitat quality; implement closures if determined beneficial In addition to alternative A acquisition, increase permanent conservation of these habitat types through Service acquisition in fee simple of 123 acres, and 13 acres in conservation easement; all acquisition would be from willing sellers	Increase permanent conservation of this habitat type through Service acquisition in fee simple of 140 acres; all acquisition would be from willing sellers
Lakeshore Pine-Hemlock	Continue passive management on the 232 acres in this habitat type Continue to restore natural vegetation on unauthorized camp sites and surplus cabins sites that have been removed Monitor habitat impacts from public use and record wildlife use when staffing and funding allows Continue to acquire up to 288 acres from willing sellers within current, approved boundary	In addition alternative A: Work with NHNHB to establish measures of ecological integrity and implement a monitoring program in the jack pine type Protect/retain large legacy trees, and large standing and downed dead wood, or any tree observed to be used by eagles and osprey for perching	In addition to alternative A: Determine historical distribution, composition, and development of this habitat type and evaluate whether historical context can be reestablished; overall objective would be to create a habitat complex that would eventually be sustained through natural ecological processes with minimal intervention
Bald Eagle and Osprey	In partnership with NHFG, MDIFW, and other conservation partners, continue to conduct annual bald eagle and osprey nest surveys Continue to actively protect nest sites where warranted (e.g. restricted public access, buoy lines, predator guards, outreach and education)	In addition to alternative A, protect: All active nest trees with a 600 foot no-disturbance buffer All historic nest sites, nest trees, and partially constructed nest trees All stands with replacement potential as nesting habitat	Same as alternative B

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 2. (cont'd) Manage floodplain and lakeshore habitats to benefit Federal trust species and other species of conservation concern			
Bald Eagle and Osprey (cont'd)	Protect super-canopy trees Support efforts to eliminate practices that contribute to lead and other contaminants		
Goal 3. Manage upland forested habitats, consistent with site capabilities, to benefit Federal trust species and other species of conservation concern			
Responds to Issues: Which upland forest habitats and forest-dependent species should be a management priority? How will we manage for them on the refuge?			
Mixed Forest Matrix With 3 embedded habitat types: 1) Spruce-Fir 2) Mixed Woods (spruce-fir-hardwood mix) 3) Northern Hardwood	Continue passive management on the 9,913 acres in this habitat type Continue to work with NHFG and MDIFW to identify and protect all deer winter yards Continue to conduct annual breeding bird surveys Continue to acquire up to 3,967 acres from willing sellers within current, approved boundary	Actively manage to promote and sustain high quality habitat for refuge focal species identified in objective 3.1 (e.g. blackburnian, Canada, and black-throated green warblers, and American woodcock); within habitat management units, establish treatment areas and manage to promote desired forest stand conditions using accepted silvicultural practices. Protect/retain large legacy trees, and large standing and downed dead wood and favor the spruce component in management activities. See appendix K for additional details on forest management guidelines. Continue to conduct alternative A breeding bird surveys; cooperate with NHFG and MDIFW in developing management plans, consistent with priority focal species management, for critical deer winter yards to ensure their effectiveness over the long-term Work with lynx recovery team to determine any future management potential In addition to alternative A acquisition, increase permanent conservation of these habitat types through Service acquisition in fee simple of 28,575 acres, and 17,080 acres in conservation easement; all acquisition would be from willing sellers	Manage mixed forest matrix development across the refuge landscape to approximate the native species and the ecological processes, including natural disturbance regime, characteristic of the mixed forest matrix within their natural range of variation; overall objective would be to create a mosaic of habitat types that would eventually be sustained through natural ecological processes with minimal intervention Utilize the TNC publication "Natural Dynamics Silviculture" (Roe and Ruesink 2004) as a guide for management In addition to alternative A acquisition, increase permanent conservation of the mixed forest matrix through Service acquisition in fee simple of 71,416 acres; all acquisition would be from willing sellers

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 4. Provide high quality wildlife-dependent activities such as hunting, fishing, wildlife observation, and photography			
Responds to Issues: What is the appropriate level of use for each of the six priority public use programs on the refuge: hunting, fishing, wildlife observation and photography, environmental education and interpretation? What means of access will we allow for these activities? How will we manage remote camping on the refuge?			
Hunting	Continue to offer a hunt program, consistent with respective state regulations and seasons and annual Refuge Hunt Plan, except no turkey hunting on refuge lands, and no bobcat hunting on refuge lands in Maine Continue to maintain 6 waterfowl hunt blinds and allow use under a reservation system	In addition to alternative A: Improve information materials provided to hunters (e.g. allowed access, other restrictions) Increase knowledge of refuge harvest information and hunter satisfaction; in cooperation with state, local hunt clubs, volunteers, or other partners, establish refuge check stations and/or issue free special use permits and require reporting Within 1 year of CCP approval, implement administrative process, including additional NEPA analysis and public involvement opportunities, to open refuge lands in both states to turkey hunting, and open refuge lands in Maine to bobcat hunting, consistent with respective states' regulations.	Same as alternative B, except the objective is to promote a backcountry, low density hunt experience. Actions that would differ include: Establish hunting units and distribute use and limit numbers through free special use permit program; No new developments, facilities, or improved access would be provided; majority of area is walk-in use only
Fishing	Continue to allow fishing, consistent with respective state regulations and seasons; except public access may be restricted in certain areas to protect loon, bald eagle, and osprey nests Continue to host Take Me Fishing event	In addition to alternative A: Complete all administrative actions to officially open the refuge to fishing Provide improved lake and river shoreline access at designated sites, and new proposed sites, including provisions for anglers with disabilities at new Mountain Pond fishing access If acquired from willing sellers, create a new fishing and boating access site at Sturtevant Pond. Increase knowledge of refuge harvest information an angler satisfaction through creel surveys; and Work with NHFG and MDIFW to maintain high quality brook trout fishery in the Rapid, Dead Diamond, and Dead Cambridge rivers	Same as alternative B, except the objective is to promote a remote, low density angling experience. Actions that would differ include: Consider permit system once thresholds have been breached No new developments, facilities, or improved access would be provided; majority of area is walk-in use only

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 4. (cont'd) Provide high quality wildlife-dependent activities such as hunting, fishing, wildlife observation, and photography			
Wildlife Observation and Nature Photography	Continue to maintain Magalloway River trail and viewing platform Continue to allow use of waterfowl blinds under a reservation system which, in addition to hunting, provides for observing and photographing wildlife	In addition to alternative A: Create safe, accessible wildlife viewing pull-outs on Route 16 and 26 in partnership with NHFG, MDIFW, and state highway departments Provide other new infrastructure, including trails, identified under "Goal 5: Interpretation" discussion Work with NHFG, MDIFW and other partners to develop regional wildlife viewing trails across ownerships (e.g. auto, canoe/kayak, walking, snowmobile, etc) with associated visitor contact materials Develop a wildlife viewing reporting system (e.g. on-line web-based)	In addition to alternative A, the objective is to promote a backcountry, low density wildlife observation and photography experience. The only new developments would be around Potter Farm facility and the roadside pullouts on Routes 16 and 26. No other facilities, or improved access on-refuge would be provided; majority of area is walk-in use only.
Camping	Continue cooperative program with NH DRED-Parks and Recreation allowing them to administer 14 remote, designated camp sites on refuge lands (12 sites on lake; 2 on river) Continue to maintain and improve campsites on an annual basis Continue seasonal closures of certain sites when warranted to reduce impacts to nesting loons and other wildlife	In addition to alternative A: Complete cooperative agreement with NH DRED-Division of Parks and Recreation to formalize administration, implementation and stipulations; Close the 2 river camp sites and rehabilitate them to native vegetation Utilize the proposed Umbagog Lake Working Group to advise on and help develop a voluntary, interagency plan for remote camping across ownerships and jurisdictions. Such considerations as setting fees, limits on camper numbers and use restrictions, distribution of sites, safety, site protection and restoration, season length, and reservation system would be explored	Same as alternative B, except the objective is to promote a primitive, low impact experience. Actions that would differ include: Limit infrastructure at camping sites, limit number of campers/site, do not allow fires, and require campers to bring portable toilets

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 5. Develop high quality interpretive opportunities, and facilitate environmental education, to promote an understanding and appreciation for the conservation of fish and wildlife and their habitats, as well as the role of the refuge in the Northern Forest.			
Responds to Issues: What is the appropriate level of use for each of the six priority public use programs on the refuge: hunting, fishing, wildlife observation and photography, environmental education and interpretation? What means of access will we allow for these activities?			
Interpretation	Continue to respond to requests for programs when staffing and funding allows; demand would continue to far exceed staff's ability to respond Continue efforts to complete Magalloway River interpretive trail, including its ¼ mile loop expansion, and the Magalloway River self-guided canoe and kayak trail	In addition to alternative A: Develop Visitor Services Plan and implement all programs identified under goals 4 and 5; seek funding to hire a VSP Increase interpretive programs by providing guided walks and boat trips, or other programs at state campground Improve self-guided interpretative information at Magalloway River trail and along approved, designated snowmobile trails. Insure proposed walking and canoe/kayak trails (e.g. new walking trails at Potter Farm, Thurston Cove, and Mountain Pond areas, and along Route 16: and, Magalloway River self-guided boat trail) have high quality, self-guiding interpretive materials See also Goal 6: "Partner-managed visitor facilities"	Same as alternative B, except, only the Potter Farm trail loop, which requires new construction, would be included. Other trail options may be considered in the future if no new construction is necessary. The overall objective is to promote a backcountry, low density experience. Actions that would differ include: Limit group size to <20 individuals Maintain interpretive signage only at trailheads
Community Outreach	Continue to coordinate two annual community events: Umbagog Wildlife Festival, and Take Me Fishing. While the main venue for these programs are in town, include coordinated on-refuge programs when staffing and funding are available Continue to distribute brochures and literature on impacts to wildlife from lead fishing tackle	In addition to alternative A: Create new, and improve existing outreach materials (newsletter, website, media and press kits, fact sheets, virtual tours of refuge and webcams at bald eagle and loon nesting sites) Coordinate with states and Umbagog Lake Working Group to develop lake access management plan and outreach materials; better explain where public access is allowed and why there are area closures and other restrictions to protect resources; also, cooperatively implement an informational sign program in visitor concentration areas Conduct outreach specifically targeted at refuge neighbors to encourage their awareness, interest and involvement in refuge activities See also Goal 6: "Partner-managed visitor facilities"	Same as alternative B

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 5. (cont'd) Develop high quality interpretive opportunities, and facilitate environmental education, to promote an understanding and appreciation for the conservation of fish and wildlife and their habitats, as well as the role of the refuge in the Northern Forest.			
Environmental Education	No current program	Facilitate partner-led educational program development and implementation on the refuge; refuge staff and resources would be limited Evaluate potential for adult educational partnerships through universities or programs such as Elder Hostel	Same as alternative B
Goal 6. Enhance the conservation and management of fish and wildlife resources in the Northern Forest Region through partnerships with public and private conservation groups, private landowners, State and local entities			
Responds to Issues: What should be the refuge's role in land conservation efforts in the Upper Androscoggin River watershed? Should we pursue a refuge expansion? How can the refuge and its staff be an asset to local communities and support their respective vision and goals for the area?			
Land Conservation and Protection	Continue to participate in regional land conservation partnerships Continue to acquire 6,392 total acres of high priority habitat (delineated by respective habitat types above) within the current, approved refuge boundary to achieve refuge establishment purposes (e.g. protecting wetlands and wetlands-dependent wildlife, and adjacent uplands in the watershed)	In addition to acquisition priorities under alternative A, increase contribution to conserving significant habitats and species of conservation concern through Service fee-simple acquisition of 32,159 acres and 17,559 acres in conservation easements	In addition to acquisition priorities under alternative A, increase contribution to conserving significant habitats, native species, and the ecological processes characteristic of the Northern Forest within their natural ranges of variation, through Service fee-simple acquisition of 76,304 acres
Regional and Community Partnerships	Continue working with the numerous partners identified under objective 6.1 to address both regional (e.g. Northern Forest and Upper Androscoggin watershed) and local (town, individual resource or program) issues and opportunities	In addition to alternative A: Explore the potential for a regional Umbagog Area Friends Group Participate in regional and local community economic development and conservation partnerships and initiatives, such as Upper Androscoggin Advisory Committee	Same as alternative B

Refuge Resource or Program	Alternative A Current Management	Alternative B Service-preferred alternative	Alternative C
Goal 6. (cont'd) Enhance the conservation and management of fish and wildlife resources in the Northern Forest Region through partnerships with public and private conservation groups, private landowners, State and local entities			
Cooperative Management of Umbagog Lake	Nothing formal established, but continue to work with NHFG and MDIFW to conduct boater and angler safety and ethics outreach during festivals and individual visitor contacts	In addition to alternative A: Promote the establishment of an interagency, inter-jurisdictional Umbagog Lake Working Group to recommend consistent regulations and best management practices, and to address user and resource issues that cross ownerships	Same as alternative B
Partner-managed Visitor Facilities	None	With local business and town officials and state partners, develop a visitor contact facility in Errol to orient visitors to the Umbagog region	Same as alternative B
Goal 7. Develop Umbagog National Wildlife Refuge as an outstanding center for research and development of applied management practices to sustain and enhance the natural resources in the Northern Forest in concert with the Land Management Research Demonstration (LMRD) Program			
Responds to Issues: Same as goals 1-3 and 6.			
Research and Applied Management	No program	Seek support and funding to establish the refuge as an LMRD site; hire an LMRD coordinator to facilitate implementation Conduct a research needs assessment for the refuge and develop a mission and framework for a research program	Same as alternative B, except program emphasis is on natural landscape composition, patterns, and processes
Outreach for Research and Management Programs	None	Facilitate demonstration area on-refuge, and on other conservation ownerships, that showcase applied management to benefit natural resources Cooperate with Partners for Wildlife program to accomplish outreach, demonstration projects, and seek funding Conduct workshops, courses, and other technical forums Publish research findings in peer-reviewed publications	Same as alternative B