U.S. Fish & Wildlife Service

Great Meadows National Wildlife Refuge

Final Comprehensive Conservation Plan

January 2005

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

The U.S. Fish and Wildlife Service is the principle federal agency for conserving, protecting, and enhancing fish and wildlife in their habitats for the continuing benefit of the American people. The Service manages the 96-million acre National Wildlife Refuge System comprised of 544 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological services field stations. The agency enforces federal wildlife laws, manages migratory bird populations, restores significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

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

Cover photo: Marsh Wren by USFWS Staff

Comprehensive Conservation Plan Approval
for Great Meadows National Wildlife Refuge

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Date

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Final Approval:

1-5-05

Marvin E. Moriarty
Regional Director, Region 5
U.S. Fish and Wildlife Service

Date

Finding of No Significant Impact
Assabet River, Great Meadows, and Oxbow National Wildlife Refuges
Comprehensive Conservation Plans

The Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) of July 2003 for Assabet River, Great Meadows, and Oxbow National Wildlife Refuges (NWRs) evaluated three management alternatives, carefully considering their impacts on the environment, and their potential contribution to the mission of the National Wildlife Refuge System, and each refuge's purposes and goals. A brief summary of the three alternatives follows.

Alternative A: This was the No Action Alternative in the Draft CCP/EA required by the Council of Environmental Quality's regulations on implementing the National Environmental Policy Act. Under this alternative, there would be no change from our current resource management programs on refuge lands. The refuges continue programs they currently have in place. No new efforts are undertaken, and land acquisition occurs only for those parcels already within the approved refuge boundaries.

Alternative B: This alternative was the Service's Proposed Action in the Draft CCP/EA. Land acquisition occurs only within the refuge boundaries. This alternative emphasizes inventorying and monitoring refuge resources. It includes increased opportunities for habitat management. This alternative also offers more wildlife observation, photography, environmental education, and interpretation opportunities as well as new hunting and fishing opportunities on all three refuges. Under this alternative dog walking is eliminated as an activity on the refuges.

Alternative C: Alternative C is similar to Alternative A, but places emphasis on a less intrusive management style. Inventory and monitoring of refuge resources would occur, but would be limited. The refuges would support similar programs as existing now, but not expand habitat management programs as Alternative B does. This alternative is also distinguished from others with less expansion of the priority public use opportunities and active management programs.

The draft CCP/EA was distributed for a 45 day public review and comment period from July 20th to September 3rd, 2003. After consideration of all public comments, I determined that this Environmental Assessment was sufficient to support my findings.

After careful review of the proposed management actions, and based on the analysis provided in the EA and the comments received during the review period, I have selected Alternative B (the Service's Proposed Action in the Draft CCP/EA) for implementation, with the following modifications:

- Alternative B proposed continuing to allow jogging on Great Meadows and Oxbow NWRs. We have completed a Compatibility Determination (CD) which

concludes that jogging is compatible with refuge purposes. However, a study of the impacts of jogging on wildlife will be initiated and results evaluated to evaluate site specific impacts to wildlife. The CD will be reviewed and any appropriate changes will be made using the site specific data in 5 years.

- Alternative B proposed to eliminate all picnicking from the refuges. We have clarified our rules, such that no picnic tables will be provided nor will large gatherings or events involving food be permitted. Eating snacks on refuge benches and trails is allowed.

- Alternative B proposed a variety of hunting opportunities on all 3 refuges. We proposed creating hunting opportunities on Assabet River and Great Meadows NWRs and expanding hunting opportunities on Oxbow NWR. We have modified our hunting proposal:

    - We modified our original hunting proposal based upon additional analysis of state mandated safety zones, our ability to effectively administer the hunt program, and to balance the needs of the different wildlife-dependent recreationists.

    - We clarified that the waterfowl hunting areas along the Concord and Sudbury Rivers at Great Meadows and the Nashua River at Oxbow areas include the main stems of the rivers as well as adjacent wetlands and pools.

    - We adjusted the proposed waterfowl hunting areas to remove areas near concentrations of houses, playing fields, and high numbers of additional users.

    - The total acreage that we are proposing for waterfowl hunting is 1,192 acres.

    - We revised the deer hunting program to archery hunting only in areas of specific safety concern.

- We have revised the proposed fee program to be consistent with other Region 5 refuges and to encourage purchase of the "local" annual pass. Fees would be required at Assabet River, Oxbow (south of Route 2), and the Concord impoundments of Great Meadows. Visitors would be able to use a duck stamp in lieu of the refuge access fee. All access fees are per car or per group for pedestrians.

- We have not modified our proposal to eliminate dog-walking on Great Meadows and Oxbow NWRs. Assabet River NWR is not yet open to the public. When it opens, dog-walking will not be allowed.

I have selected Alternative B, with the modifications noted above, because it helps fulfill the mission of the National Wildlife Refuge System; best achieves each refuge's purposes, vision, and goals; maintains and, where appropriate, restores the ecological integrity of both refuges; addresses the significant issues identified during the planning process; and is consistent with principles of sound fish and wildlife management.

I find that the implementation of modified Alternative B will not have a significant impact on the quality of the human environment in accordance with Section 102 (2) (c) of the National Environmental Policy Act. It adheres to all legal mandates and Service policies. As such, I have concluded that an Environmental Impact Statement is not required, and this Finding of No Significant Impact is appropriate and warranted.

1-5-05

Marvin Moriarty
Regional Director
U.S. Fish and Wildlife Service
Hadley, Massachusetts

Date

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Chapter 1: Introduction and Background

This final Comprehensive Conservation Plan (CCP) has been prepared for the Great Meadows National Wildlife Refuge (NWR), which is one of eight refuges of the Eastern Massachusetts National Wildlife Refuge Complex (Complex) (see Map 1-1). Concurrently, we are releasing the Final CCPs for Oxbow and Assabet River NWRs.

We will prepare a separate CCP and Environmental Impact Statement (CCP/EIS) for Monomoy and Nomans Land Island NWRs beginning later in 2004. We propose to begin the CCP process for Massasoit NWR in 2005 and Nantucket and Mashpee NWRs in 2006.

This CCP is the culmination of a planning process that formally began in January 1999. Numerous meetings with the public, the state, and conservation partners were held to identify and evaluate management alternatives. A draft CCP and Environmental Assessment (CCP/EA) was distributed for public review and comment in July 2003. This CCP presents the management goals, objectives, and strategies that we believe will best achieve our vision for the refuge, contribute to the National Wildlife Refuge System (Refuge System) Mission, achieve refuge purposes and legal mandates, support regional conservation priorities, and serve the American public.

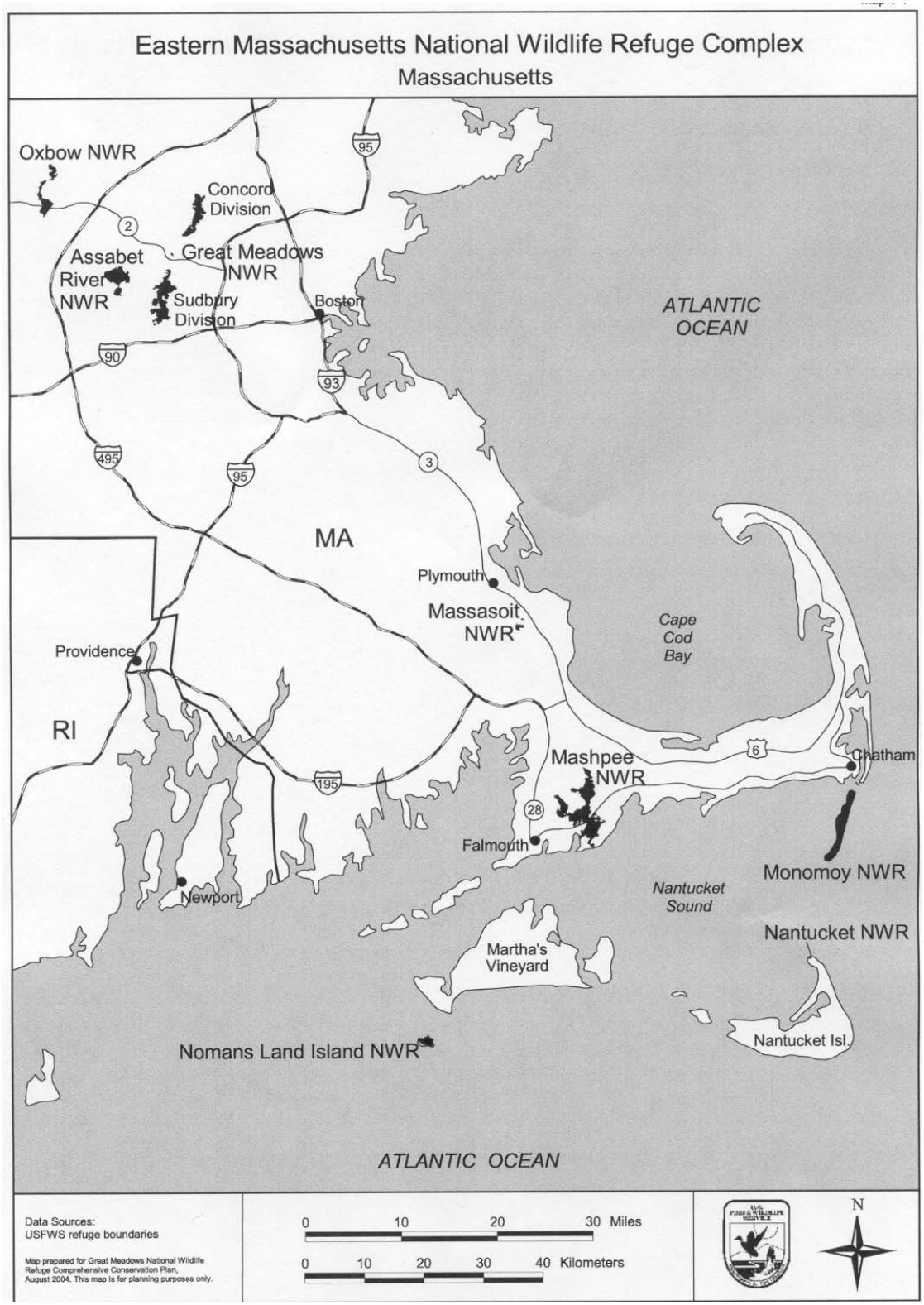
Refuge Overview

Established in 1944, the Concord impoundments became the first tract of land at Great Meadows. The current extent of the refuge includes 3,863 acres and extends into eight towns. The refuge was created under the Migratory Bird Conservation Act "*for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*"

Concord Impoundments of Great Meadows NWR.
USFWS Photo

The refuge is divided into two divisions: the Concord Division (1,542 acres) and the Sudbury Division (2,321 acres). The Concord and Sudbury Divisions provide habitat for a variety of species. For example, the Concord impoundments are utilized by many migrating waterfowl, shorebirds, wading and marsh birds. The upland areas support woodcock, songbirds, and many raptors. The marsh habitats are utilized by amphibians and reptiles. This diversity of habitats contributes to a number of regional conservation priorities.

Map 1-1: Eastern Massachusetts National Wildlife Refuge Complex



The refuge's interspersion of wetland, forested upland and old field habitats is ideally suited for this purpose. The refuge supports a diverse mix of migratory birds including waterfowl, wading birds, raptors, shorebirds, passerines, as well as resident mammals, reptiles, amphibians, fish and invertebrates. The extensive and regionally significant wetlands occurring on and adjacent to the refuge, including their associated tributary drainages andheadwaters, have been listed as a priority for protection under both the North American Waterfowl Management Plan (NAWMP) and the Emergency Wetlands Resources Act of 1986.

Purple flower: Photo by Marijke Holtrop

The refuge's geographic position, accessibility to the local and regional communities, and its diverse biological resources also makes it highly attractive for natural resource educational or interpretive programs, and compatible wildlife dependent recreational uses. An estimated 500,000 people visited the refuge in 2000.

The eight Eastern Massachusetts NWRs are managed as a Complex, with centrally stationed staff taking on duties at multiple refuges. Great Meadows is one of two staffed offices within the Complex and houses the Refuge Complex Headquarters and administrative personnel.

Purpose and Need for a CCP

The purpose of a CCP is to provide managers and other interested partners guidance and direction for each refuge over the next 15 years. It is a framework that will assist in achieving refuge purposes and contributing to the mission of the Refuge System. The plan identifies what role the refuges play, consistent with sound principles of fish and wildlife conservation, in the protection, enhancement and restoration of trust resources. This plan is also needed to:

- provide a clear statement of desired future conditions for habitat, wildlife, visitors and facilities;
- provide refuge neighbors, visitors, and partners with a clear understanding of the reasons for management actions;
- ensure management reflects the policies and goals of the refuge system and legal mandates;
- ensure the compatibility of current and future uses;
- review current boundaries of the refuges, and evaluate the need to revise boundaries to better achieve refuge purposes;
- provide long-term continuity and direction for Complex management; and,
- provide a basis for staffing and operations, maintenance, and the development of budget requests.

Currently, there is no general management plan in place for Great Meadows NWR that establishes priorities or provides consistent direction for managing fish, wildlife, habitats, and public uses on the refuge. Some specific plans have been written but are more than 15 years old. This plan will help to resolve issues related to control of nuisance and invasive species, public uses in conflict with wildlife needs, lack of opportunities for wildlife dependent recreation, and the needs of our federal trust wildlife species.

Wood Duck: Photo by Bruce Flaig

The National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act; Public Law 105-57) requires that all NWRs have a CCP in place by 2012 to help fulfill the mission of the Refuge System. The Refuge Improvement Act states that wildlife conservation is the priority of the Refuge System's lands, and that the biological integrity, diversity, and environmental health of refuge lands shall be maintained. Additionally, the Refuge Improvement Act identifies six wildlife dependent recreational uses that will receive priority consideration over other recreational uses of the refuge: wildlife observation, photography, hunting, fishing, environmental education, and interpretation.

U.S. Fish and Wildlife Service Mission

The Refuge System is managed by the U.S. Fish and Wildlife Service (Service) under the Department of Interior. The mission of the Service is:

"...working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

The Service manages NWRs, waterfowl protection areas, and National Fish Hatcheries. By law, Congress entrusts the following federal trust resources to the Service for conservation and protection: migratory birds and fish, endangered species, interjurisdictional fish, and certain marine mammals. The Service also enforces federal wildlife laws and international treaties on importing and exporting wildlife, assists with state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

National Wildlife Refuge System Mission

The Refuge System is the world's largest collection of lands and waters set aside specifically for the conservation of wildlife and ecosystem protection. The Refuge System consists of 544 national wildlife refuges that provide important habitat for native plants and many species of mammals, birds, fish, invertebrates, and threatened and endangered species, encompassing over 95 million acres. Refuges offer a wide variety of recreational opportunities, and many have visitor centers, wildlife trails, and environmental education programs. Nationwide, over 34 million visitors

annually hunt, fish, observe and photograph wildlife, or participate in interpretive activities on national wildlife refuges.

In 1997, the Refuge Improvement Act established a unifying mission for the refuge system, a new process for determining compatible public uses, and the requirement to prepare a CCP for each refuge. The new law states that the refuge system must focus on wildlife conservation. It further states that the National mission, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction for each refuge.

> "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (Refuge Improvement Act; Public Law 105-57)–*Mission of the Refuge System.*

Laws

While the Refuge System mission and each refuge's purpose provide the foundation for management, national wildlife refuges are also governed by other federal laws, executive orders, treaties, interstate compacts, and regulations pertaining to the conservation and protection of natural and cultural resources (see Appendix A for a more complete list of guiding laws).

A primary law affecting refuge management is the National Wildlife Refuge System Administration Act of 1966 (Administration Act) which authorizes the Secretary of the Interior to permit any uses of a refuge "...whenever it is determined that such uses are compatible with the major purposes for which such areas were established." The Administration Act was amended by the Refuge Improvement Act of 1997. It is also the key legislation on managing public uses, and protecting the Refuge System from incompatible or harmful human activities to ensure that Americans can enjoy refuge system lands and waters.

Additionally, it is Service policy to address how each refuge, with an approved CCP, can help achieve the goals of the National Wilderness Preservation System. Thus, concurrent with the CCP process, we have incorporated a summary of a wilderness assessment into this document (see Wilderness Assessment section in Chapter 2).

The Refuge Recreation Act of 1962 requires that any recreational use of refuge lands be compatible with the primary purposes for which a refuge was established and not inconsistent with other previously authorized operations.

The National Historic Preservation Act of 1966 provides for the management of historic and archaeological resources that occur on any refuge. Other legislation, such as the Endangered Species Act, the North American Wetlands Conservation Act, the Wilderness Act of 1964 and

particularly the National Environmental Policy Act (NEPA) all provide guidance for the conservation of fish and wildlife and their habitats.

National and Regional Conservation Plans and Initiatives Guiding this CCP

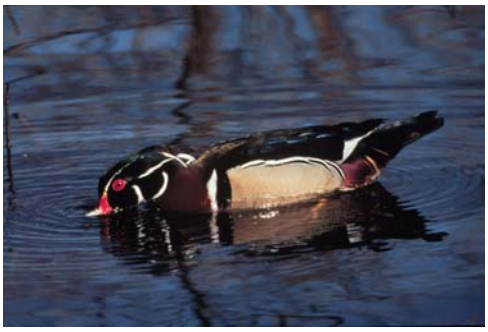
Gulf of Maine - Ecosystem Priorities

The Service has organized 52 ecosystem teams across the country. The Great Meadows NWR falls in the Gulf of Maine ecosystem (see Map 1-2). The ecosystem priorities are:

- Recover populations and habitats of endangered and threatened species.
- Protect, enhance, and restore habitats for migratory birds, anadromous and catadromous fishes, and listed species of concern in the Penobscot, Kennebec and Androscoggin River basins.
- Protect, enhance, and restore coastal habitats for trust resources of concern.
- Protect, enhance, and restore populations of migratory bird species of special concern and their habitats.
- Rebuild American shad and river herring populations in coastal rivers including the Merrimac River.
- Restore and rehabilitate Atlantic salmon populations in the Merrimac River.
- Manage Service lands to protect, enhance and restore habitats to maintain biodiversity.

North American Waterfowl Management Plan

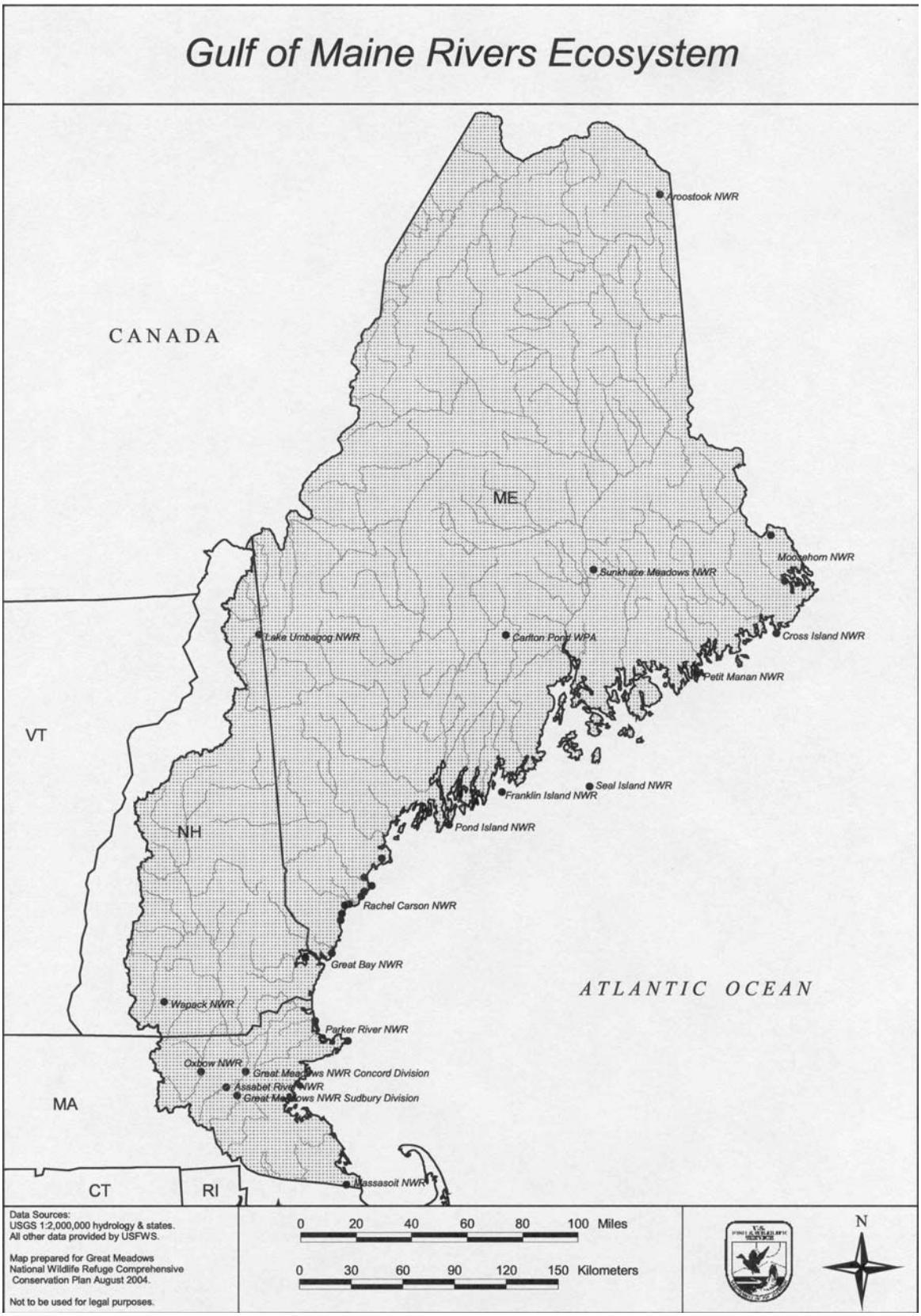
The NAWMP documents the strategy between the United States, Canada and Mexico to restore waterfowl populations through habitat protection, restoration, and enhancement. Implementation of the plan is at the regional level. Ten regional habitat "joint ventures" are partnerships involving federal, state, provincial, tribal nations, local businesses, conservation organizations, and individual citizens. Units of the Complex are contained within the Atlantic Coast Joint Venture.



Wood Duck. Photo by Bruce Flaig

The Atlantic Coast Joint Venture Program identifies seven focus areas in Massachusetts. One of these focus areas includes the inland rivers of the Blackstone, Nashua, and the Sudbury-Assabet-Concord Rivers. Great Meadows NWR is part of this focus area, with nationally significant wetlands that support migrating waterfowl. The Program is developing a focus area report that identifies important waterfowl resources, threats, and conservation recommendations.

Map 1-2: Gulf of Maine Ecosystem



A draft updated NAWMP document is at: http://birdhabitat.fws.gov/NAWMP/2003nawmpdraft.htm. In the Implementation Framework section of this document species priorities are listed for each region. Table 1-1 includes species identified in the NAWMP that occur at Great Meadows NWR.

Table 1-1: NAWMP Species Occurring at Great Meadows NWR

Species	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
American Black Duck	High	Mod. High	High	High	Highest
Lesser Scaup	High			Mod. High	High
Mallard	High	Mod. Low	Moderate	Mod. High	High
Northern Pintail	High			Mod. Low	Moderate
American Wigeon	Mod. High			Mod. Low	Mod. Low
Blue-winged Teal	Mod. High			Mod. Low	Mod. Low
Canvasback	Mod. High			High	High
Common Goldeneye	Mod. High			Mod. High	Mod. High
Bufflehead	Moderate			High	High
Gadwall	Moderate			Mod. Low	Mod. Low
Greater Scaup	Moderate			High	High
Grean-winged Teal	Moderate			Mod. Low	Mod. Low
Wood Duck	Moderate	Mod. Low	Mod. Low	Mod. Low	Mod. Low
Hooded Merganser	Mod. Low			Mod. High	Moderate
Red-breasted Merganser	Mod. Low			Mod. High	Moderate
Ruddy Duck	Mod. Low			Mod. High	Moderate

Partners in Flight Bird Conservation Plans

Partners in Flight (PIF) was initiated in 1990 as a voluntary, international coalition of agencies, organizations, institutions, industries, and other citizens dedicated to landbird conservation. The foundation for PIF's long-term strategy for bird conservation is a series of scientifically based bird conservation plans. The goal of each PIF bird conservation plan is to ensure long-term maintenance of healthy populations of native landbirds. These plans use information on bird population trends, species' distributions, and the vulnerability of the species and their habitats to threats, to rank the conservation priority of birds occurring within a particular physiographic area.

Least Sandpiper: USFWS Photo

The PIF approach differs from many existing Federal and state-level listing processes in that it (1) is voluntary and non-regulatory, and (2) focuses proactively on relatively common species in areas where conservation actions can be most effective, rather than ocal emphasis on rare and peripheral populations. A Landbird Conservation Plan for the southern New England physiographic area was completed in 2000, which includes all of eastern Massachusetts. This plan identifies 72 priority breeding bird species, 9 priority winter species, and 7

major habitat types as priorities for conservation in this area. Of the priority species for this physiographic area, at least 51 of the priority breeding species have been recorded as occurring on the refuge and 7 of the 9 wintering species have been recorded as wintering on the refuge. In the plan, focal species are selected for each habitat type and used in developing population and habitat objectives.

Implementation strategies and management guidelines for achieving these objectives are also included for each habitat type. Priority habitats for southern New England include maritime marshes, beaches/dunes, mature forest, early successional scrub/pine barrens, freshwater wetlands, and grasslands. The list of priority species, objectives, and conservation actions recommended in the southern New England Bird Conservation Plan will help direct landbird management on the refuge. Partners in Flight Bird Conservation Plans

The North Atlantic Regional Shorebird Plan (NARSP) identifies 38 priority shorebird species based upon a national scoring system that assesses population trends, relative abundance, threats and distribution patterns. The Service has recorded 23 of these species as occurring on the refuge. The NARSP builds upon the information in the U.S. Shorebird Conservation Plan (USSCP). The USSCP is a partnership involving organizations throughout the United States committed to the conservation of shorebirds. At a regional scale, the goal of the USSCP is to ensure that adequate quantity and quality of habitat is identified and maintained to support the different shorebirds that breed in, winter in, and migrate through each region. In August 2004, the USSCP was revised based upon the latest population and habitat information available. The revised list included 7 highly imperiled shorebird taxa and 23 taxa of high concern. The refuge supports 8 species of shorebirds of high concern.

Additionally, the Service has attempted to assess and integrate all the information above and compile a list of Birds of Conservation Concern for Bird Conservation Region 30, which contains the refuge. There are a total of 32 species listed, 15 of these have been recorded as occurring on the refuge.

Table 1-2: Bird Species of Concern Occurring on Great Meadows NWR

	PIF		BCR 30	NARSP	USSCP
Species	Priority Breeding	Wintering	Conservation Concerns	Priority Shorebird	High Concern
Blue-winged Warbler	●		●		
Golden-winged Warbler	●		●		
Wood Thrush	●		●		
Prairie Warbler	●		●		
Baltimore Oriole	●		●		
Scarlet Tanager					

	PIF		BCR 30	NARSP	USSCP
Species	Priority Breeding	Wintering	Conservation Concerns	Priority Shorebird	High Concern
American Woodcock	●			●	●
Rose-breasted Grosbeak	●				
Black-throated blue Warbler	●				
Chimney Swift	●				
Eastern Wood-pewee	●				
Black-and-white Warbler	●				
Hairy Woodpecker	●				
Red-headed Woodpecker	●		●		
Eastern Towhee	●				
Purple Finch	●				
American Black Duck	●	●			
Canada Warbler	●		●		
Blackburnian Warbler	●				
Bobolink	●				
Whip-poor-will	●		●		
Northern Parula	●				
Yellow-breasted Chat	●				
Glossy Ibis	●				
American Bittern	●				
King Rail	●				
Northern Goshawk	●				
Red-shouldered Hawk	●				
Northern Harrier	●				
Vesper Sparrow	●				
Least Bittern	●				
Saltmarsh Sharp-tailed Sparrow	●	●	●		
Sharp-shinned Hawk	●				
Pied-billed Grebe	●				
Cooper's Hawk	●				
Short-eared Owl	●		●		
Osprey	●				
Purple Martin	●				

	PIF		BCR 30	NARSP	USSCP
Species	Priority Breeding	Wintering	Conservation Concerns	Priority Shorebird	High Concern
Great Egret	●				
Savannah Sparrow	●	●			
Common Nighthawk	●				
Snowy Egret	●				
Little Blue Heron	●				
Great Blue Heron	●				
Common Moorhen	●				
Horned Lark	●				
Cattle Egret	●				
Common Snipe				●	
Killdeer				●	
Peregrine Falcon	●		●		
Hudsonian Godwit			●	●	●
Common Tern	●		●		
Sedge Wren	●		●		
Marsh Wren			●		
American Golden-Plover				●	●
Sanderling		●		●	●
Greater Yellowlegs				●	
Semipalmated Sandpiper				●	
Wilson's Phalarope				●	●
Solitary Sandpiper				●	●
Spotted Sandpiper				●	
Least Sandpiper				●	
Dunlin				●	
Stilt Sandpiper				●	
Short-billed Dowithcher				●	●
Red-necked Phalarope				●	
Red Phalarope				●	
White-rumped Sandpiper				●	
Western Sandpiper				●	●
Lesser Yellowlegs				●	

	PIF		BCR 30	NARSP	USSCP
Species	Priority Breeding	Wintering	Conservation Concerns	Priority Shorebird	High Concern
Baird's Sandpiper				●	
Pectoral Sandpiper				●	
Long-billed Dowitcher				●	
Black-billed Cuckoo	●				
Greater Scaup		●			
Common Loon		●			
Horned Grebe		●			

Regional Wetlands Concept Plan- Emergency Wetlands Resources Act

In 1986, Congress enacted the Emergency Wetlands Resources Act to promote the conservation of our nation's wetlands. This act requires identification of the location and types of wetlands, and which lands should be targeted for state and federal land acquisition efforts. In 1990, the Northeast Regional Office of the Service completed a regional wetlands concept plan to identify wetlands in the region. The regional plan identifies a total of 850 wetland sites and complexes in the region. 1,800 acres of wetlands associated with the Sudbury, Assabet and Concord Rivers were identified as being regionally valuable for wildlife, fisheries, and recreation.

Our Irreplaceable Heritage - Protecting Biodiversity in Massachusetts

This report recommends that the state develop a biodiversity protection strategy that outlines how all native biodiversity will be conserved. It also identifies and describes eight types of natural communities that may require immediate conservation attention because of their potential vulnerability and large number of rare species they contain. Seven of the eight communities listed in the report occur within the Complex boundary.

American Goldfinch: Photo by Sandy Selesky

Existing Partnerships

Throughout this CCP, we use the term "partners". In addition to our volunteers, we receive significant help from the following partners:

Concord River Environmental Stream Team (CREST)
Massachusetts Audubon Society
Massachusetts Department of Fish and Game (DFG), Division of Fisheries and Wildlife (MassWildlife)
Organization for the Assabet River (OAR)
SuAsCo Watershed Community Council

Sudbury, Assabet and Concord Wild & Scenic River Stewardship Council
Sudbury Valley Trustees (SVT)
The Trust for Public Land
Massachusetts Natural Heritage and Endangered Species Program (NHESP)

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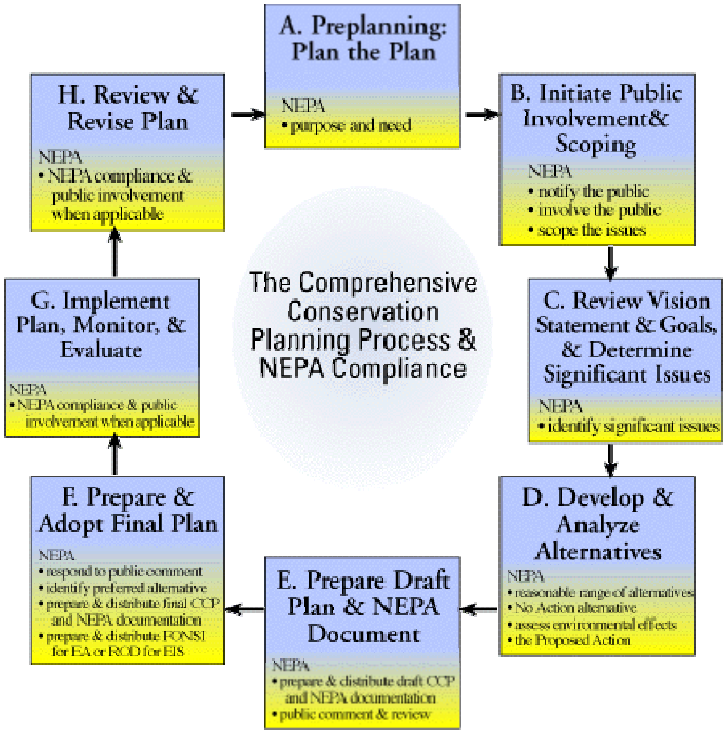
Chapter 2: The Comprehensive Conservation Planning Process

Given the mandate in the Refuge Improvement Act to develop a CCP for each national wildlife refuge, we began the planning process in 1999. We started by forming a core planning team of refuge staff and Service planners from the regional office. We placed a Notice of Intent to prepare an EIS in the January 1999 Federal Register to officially kick-off our planning effort for all eight of the Complex refuges.



First, we collected information on our biological and habitat resources. While in the process of collecting information, we initiated the public scoping and involvement part of the process. We held meetings with each town's Board of Selectmen and State and Federal agencies. Many of these groups provided information on natural resources and public uses on refuges in the Complex. In February of 1999, we held open houses in central locations to provide an opportunity for public comment on different issues including current and future management strategies, land protection and public uses. We were pleased with the participation at many of our meetings, which ranged from 30 people to over 100.

We recognized that attending our open houses would be difficult for many and designed an Issues Workbook to encourage additional comment. Over 8,000 people representing a variety of interests received workbooks. Workbooks were also available at open houses and at the refuge headquarters. We received over 660 responses.

Using the information collected from our partners and through public comment we identified significant issues to be addressed in the plan. In August of 1999, we distributed a Planning Update to everyone on our mailing list describing the key issues identified for each refuge.
Once key issues were determined and refined, we developed alternative strategies to address each one. We derived the strategies from public comment, follow-up contacts with partners and refuge staff. After a reasonable range of alternatives was identified, we evaluated the environmental consequences of each alternative.

In February of 2001 we recognized that producing a CCP/EIS for the entire Complex would be far too cumbersome to be efficient. At that time, we published a Notice of Intent to prepare a CCP/EA for five of the refuges in the Complex; Assabet River, Great Meadows, Oxbow, Mashpee and Massasoit NWRs. Additional issues and a need for more information prompted us to later split Mashpee and Massasoit NWRs from this draft as well.

The Service solicited comments on the draft CCP/EA for Great Meadows, Assabet River, and Oxbow NWRs from July 20 to September 3, 2003. We contracted with the U.S. Forest Service's Content Analysis Team (CAT) to compile the nearly 2,000 comments that we received. The CAT developed a summary report of comments (Appendix B) as well as a database of individual comments. We utilized the CAT report and comment database to develop a list of substantive comments that required responses. Editorial suggestions, along with general notes of concurrence with or opposition to certain proposals that did not contain factual arguments were noted and included in the decision making process, but do not receive formal responses. We have included our responses to requests for additional information or clarification, provisions of additional information, and specific concerns as Appendix C. We have made changes to the CCP where appropriate.

The final product of the process is three stand-alone CCPs, one for each refuge. Implementation of the CCP can occur once the Finding of (No) Significant Impact (FONSI) is signed.

We will evaluate our accomplishments under the CCP, each year. Monitoring or new information may indicate the need to change our strategies. The collection of additional data at Great Meadows NWR will likely require modification and specification of the wildlife and habitat management strategies. We will modify the CCP documents and associated management activities as needed; following the procedures outlined in Service policy and NEPA requirements. The CCPs will be fully revised every 15 years or sooner if necessary.

Wilderness Assessment

The planning team conducted a Wilderness Assessment, as required by Refuge Planning Policy, to determine if any lands and waters in fee title ownership were suitable to be proposed for designation as a Wilderness Area. During the inventory stage, we determined that Great Meadows NWR does not fulfill the eligibility requirements for a Wilderness Study Area as defined by the Wilderness Act. The refuge and its surrounding area have been altered in some way by man, with the imprint of man's work generally noticeable. The refuge does not have 5,000 contiguous acres or is not of sufficient size as to make practicable its preservation and use in an unimpaired condition. Furthermore, permanent roads are contained within

the refuge. Therefore, suitability of the lands for Wilderness Designation is not analyzed further in this document.

Issues, Concerns, and Opportunities

Issues, concerns, and opportunities were brought to the attention of the refuge planning team through early planning discussions with local governments, State, and Federal representatives, and through the public scoping process. We received comments from the public both verbally at open houses and in writing, through Issues Workbooks and individual letters. Some issues were identified by the Service and others were raised during the public review of the Draft CCP/EA. Many issues that are very important to the public often fall outside the scope of the decision to be made within this planning process. In some instances, the Service cannot resolve issues some people have communicated to us. We have considered all issues throughout our planning process, and have developed plans that attempt to balance the competing opinions regarding important issues.

Habitat and wildlife management

Many people were interested in our management programs. The Complex has begun additional surveys and inventories to collect baseline information on all of the refuges in the Complex. The public is interested in how we manage the freshwater impoundments at the Concord Division, and migratory birds and upland habitats on Great Meadows NWR as a whole. A Habitat Management Plan (HMP) is being developed which will provide a detailed description of our goals and objectives for habitat management at the Great Meadows NWR.

Control of invasive, injurious, and overabundant plant and animal species

Purple Loosestrife: USFWS Photo

Invasive species, including water chestnut, common reed, and purple loosestrife are a concern on the refuge. These species limit the productivity of wildlife habitat. Management to control invasive species was mentioned as a watershed-wide priority to some conservation associations. We will continue efforts to control known invasives on the refuge and are experimenting with different control techniques for various species.

Hunting

Requests were made at public meetings and through written comments both to allow and not to allow deer hunting on the refuges. Poaching is a problem on the Sudbury Division of Great Meadows NWR. There have been suggestions to provide lawful hunting opportunities on the refuge to control deer populations. Some would like to see waterfowl hunting on the Concord Division of the Great Meadows NWR. Cooperation with local

towns and hunting groups was a suggestion. Others oppose hunting of any kind on the refuge.

Management of public use and access

The Complex Headquarters and visitor contact station is located in Sudbury, MA. The need for environmental educational programs in local schools as well as additional interpretive opportunities where the public can learn about the refuge was raised.

Blue Iris: Photo by Marijke Holtrop

Great Meadows NWR supports high visitation annually. We estimate use at Great Meadows NWR to be around 500,000 visitors per year, with the majority of visitors at the Concord impoundments. We do not have a consistent process for collecting and documenting visitation at all sites nor do we have the funds to initiate such a process at this time. Several non-wildlife dependent recreational activities occur on the refuge. Many visitors use trails for dog walking and jogging.

Resource protection and visitor safety

Many people voiced concerns regarding the need to control poaching, trespassing and other refuge regulations violations.

Infrastructure and Operations and Maintenance

We heard from some people that the refuge doesn't have the resources and staff needed to support programs and maintenance of the refuge.

Issues and Concerns Considered Outside the Scope of This Plan

External threats to the refuge such as water quality and contamination

Poor water quality in the Concord and Sudbury Rivers prompted concern among citizens. The Concord and Sudbury Rivers both are reported to have high levels of contamination. In these watersheds, the Service is currently involved in watershed-wide efforts and partnerships to review and reduce impacts to the communities and to refuge resources. Service contaminants specialists represent wildlife interests in contaminants cleanup efforts that directly affect refuge lands, such as lands transferred to the Service or rivers that flow into the refuge. Some cleanup efforts are the responsibility of other agencies. Refuge staff or Service specialists are not often involved in such regional efforts.

Some towns wish to develop water supply wells on refuge property

Some towns requested access for the purpose of drilling water supply wells. Wells have been shown to draw down the surrounding water table. A 1994 study by the Massachusetts Office of Water Resources identified that "wells can have a significant impact on nearby (surface) water bodies and may affect specific biological resources." Concerns were raised by the public during CCP scoping that disturbance to wildlife, and other impacts due to the wells, or access to the wells, could occur. The Town of Carlisle does have reserved water rights on the refuge.

Expanded use of Hanscom Air Field

MassPort operates Hanscom Air Field, sited in Bedford, Concord, Lincoln, and Lexington. The proposal is to use the airstrip as an auxiliary airport for the Boston Airport, as well as increasing the number of flights per day. The Concord impoundments of Great Meadows NWR lie directly west of Hanscom's east-west runway. The MassPort plans for expansion of Hanscom may affect wildlife conditions and visitor experience on Great Meadows NWR. At issue are noise, overflights above a national wildlife refuge, fuel dumping that occurs on landing, water quality, and the concentration of storm water runoff from runways and impervious surfaces. Although the refuge has no jurisdiction in resolving these issues with Hanscom Field, we support a restriction on volume of air travel to and from Hanscom and will work to ensure that noise impacts on waterfowl, wildlife, and visitors is given more consideration by MassPort.

Forested Wetland: Photo By Emily Holick

Chemical control of mosquitoes on national wildlife refuges nationwide is being evaluated by the Service

The Service has developed a draft national mosquito policy for refuge managers to apply when determining how and when mosquito populations may be managed on lands administered within the Refuge System. The science-based draft policy indicates that mosquito populations will essentially be allowed to function unimpeded as part of the wetland ecosystem. Mosquito populations may be reduced in certain circumstances and we work with State and local public health departments and mosquito abatement agencies to monitor and if necessary contain mosquito-borne diseases. Mosquito spraying to control larval mosquitoes on Great Meadows NWR has not occurred since 1999. The decision to restrict mosquito control on the refuge is consistent with the current draft policy. Any future Service policy will be applied to Great Meadows NWR.

Jet Skis on the Concord River

Many residents and the National Park Service oppose the use of jet skis on the Concord River, particularly with its Wild and Scenic River status. The Commonwealth of Massachusetts prohibits the operation of watercraft "in excess of five miles per hour" when the craft is within 150 feet of any channel, tunnel, pier, mooring, wharf, or other floating structure or swimming beach" (MA State Forests and Parks regulation 304 CMR 12.34). This regulation is not applicable to waters adjacent to the refuge, since none of the identified structures are found on the refuge and swimming is not allowed. Our ability to regulate motorized vessels, including jet skis, is limited to acts within our refuge boundary that influence refuge flora and fauna. For example, if a boat travels at excessive speed and throws a wake onto the refuge which causes waterfowl to fly, the operator of that boat could be cited. Careless and unreasonable operation of a vessel, such as the jumping that occurs with many jet skis, can also be regulated. Jet skis can interfere with wildlife-dependent recreation such as fishing, hunting, and wildlife observation from canoes. Fishing recreationists have frequently complained of jet ski disturbance during their use of the refuge. Some have suggested that this problem could be countered with better patrolling by the refuge. River patrols have increased in 2004 and a number of notices of violation have been issued. Refuge staff will continue to work with all the governmental entities having some degree of jurisdiction over the rivers and their use, and changes to address problems could occur in the future.

Chapter 3: Refuge and Resource Descriptions

Geographic/Ecosystem Setting

Great Meadows NWR is located in east-central Massachusetts, approximately 20 miles west of Boston, in the historic towns of Concord, Sudbury, Bedford, Billerica, Lincoln, Carlisle, Wayland and Framingham. The refuge comprises two divisions: lands south of State Route 117 compose the Sudbury Division; lands north of State Route 117 compose the Concord Division. The refuge contains 3,863 acres, and stretches 12 miles from State Route 4 in Billerica to the Framingham/Wayland town line.

Entrance Sign: USFWS Photo

The refuge was established in 1944 as "an inviolate sanctuary, or for any other management purpose, for migratory birds" (Migratory Bird Conservation Act, 16 U.S.C. §715d). The Refuge Recreation Act identified refuges as "suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, and (3) the conservation of endangered species or threatened species…" (16 U.S.C. §460k-1). The biological resources of the refuge are valuable to both resident and migrant wildlife. The refuge lies in the Atlantic flyway and, as a stopover site for migrating birds, provides vital habitat and food. Species seen there during migration include green-winged teal (*Anas crecca*), least sandpiper (*Calidris minutilla*), marsh wren (*Cistothorus palustris*), swamp sparrow (*Melospiza georgiana*), and the willow flycatcher (*Empidonax traillii*). Several upland locations provide habitat for the American woodcock (*Scolopax minor*) and the eastern bluebird (*Sialia sialis*).

The area surrounding the refuge has a long history of conservation that continues throughout the thousands of acres of conservation land administered by a variety of state, federal, local, and private landowners. Additionally, there is a vast amount of information available with regard to the refuge area that cannot be included here. Information relevant to refuge management is presented here. Additional sources of information can be found in *A Bibliography of the Biodiversity and Natural History of the Sudbury River-Concord River Valley, including Great Meadows, the Estabrook Woods and Walden Woods* (Ells 2002).

The refuge also serves as an outdoor classroom for thousands of local schoolchildren, and at times offers programs for visitors. In the past, the refuge has hosted an annual bluebird day, American woodcock walks, orienteering programs, and owl prowls.

Socio-Economic Setting

The Refuge Revenue Sharing Act of June 15, 1935, as amended, provides annual payments to taxing authorities, based on acreage and value of refuge lands located within their jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from Congressional appropriations. The Congressional appropriations are intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local taxing authorities. The actual Refuge Revenue Sharing Payment does vary from year to year, because Congress may or may not appropriate sufficient funds to make full payment.

The Refuge Revenue Sharing Payments are based on one of three different formulas, whichever results in the highest payment to the local taxing authority. In Massachusetts, the payments are based on three-quarters of one percent of the appraised market value. The purchase price of a property is considered its market value until the property is reappraised. The Service reappraises the value of refuge lands every five years, and the appraisals are based on the land's "highest and best use". On wetlands and formerly farmland-assessed properties, the full entitlement Refuge Revenue Sharing payments sometimes exceed the real estate tax. In other cases, Refuge Revenue Sharing payments may be less than the local real estate tax.

Table 3-1: Revenue Sharing Payments for Towns Associated with Great Meadows NWR

	Bedford	Billerica	Carlisle	Concord	Lincoln	Sudbury*	Wayland
2003	$9,141	$11,769	$9,732	$5,255	$157	$35,474	$25,389
2002	$9,511	$2,791	$10,125	$5,468	$163	$36,909	$25,160
2001	$10,181	$2,988	$10,839	$5,853	$174	$29,331	$26,806
2000	$7,796	$1,743	$1,804	$11,283	$134	$23,421	$18,196
1999	$8,887	$622	$2,056	$12,862	$153	$26,699	$20,641

*Refuge revenue sharing payments for Sudbury include payments for lands in Assabet River NWR.

The fact that refuges put little demand on the infrastructure of a municipality must be considered in assessing the financial impact on the municipality. For example, there is no extra demand placed on the school system and a minimal demand on roads, utilities, police and fire protection, etc. These demands are much less than would occur if the land were developed. The owner of land adjacent to refuge land, or within the refuge acquisition boundary, retains any and all the rights, privileges, and

Trailmarker: Photo by Karla Thompson

responsibilities of private land ownership. The refuge controls uses only on the properties it owns.

All open space near metropolitan Boston's population of 6.2 million is under great pressure for recreational use. The Concord Rivers watershed is home to 365,000 people; a number that continues to grow.

Great Meadows NWR receives more than 500,000 visitors each year. The Concord impoundments, which are a popular destination for birders and school groups, draw the largest number of refuge visitors.

The boom in the local technology industry has spurred rapid construction of housing units and support infrastructure (e.g., roads, malls, plazas, utility towers, and corridors). The increase in human density and associated uses has caused considerable strains on the ecosystem from the following factors:

- Habitat loss through direct conversion of natural habitat types to developed types;
- Habitat fragmentation either through conversion of contiguous tracts of natural habitat types to a mosaic of discontinuous, smaller habitat type relicts or erection of barriers that cause direct lethal impacts to fish, wildlife, and plants (e.g., roads and communications towers);
- Habitat degradation through partial deterioration of habitat due to pollution (siltation, nutrients, pesticides, metals), exotic and pest species (phragmites, house cats), incompatible uses (all-terrain vehicles, personal watercraft);
- Water consumption that reduces subsurface and surface water due to home and business consumption and industrial applications.

Refuge Resources

Climate

The average annual temperature is 51°F. The average monthly temperature in January is 29°F; in July, 74°F. During the growing season, which spans about 225 days, the average temperature is 43°F or higher. Average annual precipitation is 41.76 inches, fairly evenly distributed throughout the year, with slightly more in November and December and less in July (http://www.nws.gov/er/box/climate/pcpnbos.html).

Geology and Topography

Evidence of glaciation in this area is readily observable. The Wisconsin glacier (12,000 Before Present (B.P.)) deposited sediment and other materials that shaped the local landscape and, in many ways, have directed

this area's development. Eighty percent of the refuge terrain is floodplain along the Concord and Sudbury rivers (McAdow 1990).

The topography of the Refuge is generally flat with some gently sloping hills, shallow streams, and depressional ponds and wetlands. While elevations on the refuge range up to 60 feet above mean sea level, the overall elevation change is barely perceptible across this area. For example, the Sudbury River drops an average of only one inch per mile (1 foot in 12 miles) in passing through the Refuge (McAdow 1990).

Soils

Refuge soils along the rivers are primarily loams: Rippowam fine sandy loam and Saco mucky silt loam. Other soils found along the rivers include Limerick silt loam with a 0%–3% slope, and Hinckley loamy sand with slopes of 0%–3% and 3%–8%. The soil of ponds 1 and 2 on the refuge (the Concord impoundments) is Freetown muck. Saco mucky silt loam composes the soils along Water Row in Sudbury.

Several refuge parcels have upland soils: the O'Rourke parcel in Carlisle; the Cook, Strand, and Wolbach properties in Sudbury; and the Lombard parcel in Wayland.

- The soils on the O'Rourke parcel include Hinckley loamy sand with slopes of 3%–8% and 15%–25%, Windsor loamy sand with slopes of 0%–3% and 3%–8%, Deerfield loamy sand with a 3%–8% slope, Wareham loamy sand with a slope of 0%–5%, and Freetown muck.

- At the Cook parcel in Sudbury, the primary soil is Wareham loamy sand with a slope of 0%–5%.

- The Strand property is comprised primarily of Freetown muck, ponded, Hinckley loamy sand with a slope of 15%–25%, Tisbury silt loam with a slope of 3%–8%, and Scio very fine sandy loam with a slope of 0%–3%.

- The Wolbach property soils are rock outcrop-Hollis complex and Hollis rock outcrop-Charlton complex with a 3%–5% slope.

- The Lombard property in Wayland consists of Merrimac-urban land complex with slopes of 0%–8% (USDA 1995 a).

Hydrology

The Sudbury-Assabet-Concord (SuAsCo) river basin encompasses 371 square miles of land and 88.1 river miles, from Billerica in the north to Westborough and Hopkinton in the south. These three rivers and their associated tributaries drain the basin into the Merrimack River in Lowell.

The Sudbury River is 41 miles long, and drains 169 square miles. It begins in Cedar Swamp Pond in Westborough, flows eastward to Framingham, then flows north through the towns of Sudbury, Wayland, Lincoln, and into Concord. The Sudbury River has three distinct sections. Its first section, upstream of Framingham, is a narrow, rapidly flowing stream. The second section consists of two large impoundments. One of those impoundments is part of the Metropolitan District Commission water supply. The Colonna Dam in Saxonville (Framingham) creates the other impoundment. The third section of the river is, perhaps, the most unique. As it flows through the Great Meadows NWR, this 12-mile section of the Sudbury River changes elevation by only 1 foot, and has been compared to an elongated lake.

The Assabet River is 31 miles long, and drains 175 square miles. It starts in Westborough, and flows northeast through the urban centers of Northborough, Hudson, Maynard, and Concord. Between these suburbanized centers lie rural and undeveloped watersheds. The repeating discharge of a sewage treatment plant characterizes the Assabet River. Its impoundments are highly eutrophic in summer, containing large amounts of aquatic growth, particularly algal blooms.

Concord River and Impoundments: USFWS Photo

The Concord River is 15.8 miles long, and drains 27 square miles. It forms at the confluence of the Assabet and Sudbury rivers in Concord, flows north through the towns of Carlisle, Bedford, Billerica, and then enters the Merrimack River in the city of Lowell. The Concord River retains the slow-moving characteristics of the third section (above) of the Sudbury River.

Surface waters on the refuge are either riverine or ponded. The three rivers primarily affect refuge habitats. The Concord River drains the Concord Division. The Sudbury River, Hop Brook, and a few unnamed tributaries drain the Sudbury Division.

Ponded waters include the Concord impoundments (Ponds 1 and 2), and the Strand and Headquarters ponds in Sudbury. We had managed the Concord impoundments primarily as stable water bodies since the mid-1970's. However, beginning in 2000, water levels in the Concord impoundments have been actively managed with the use of drawdowns to benefit shorebirds and waterfowl during different times of the year. We continuously expose an appropriate amount of new mudflat habitat during the entire shorebird migration period, draining and exposing mudflats, which support germination of wetland plants. Weekly water gauge readings

are recorded from existing measurement structures in the pools. Surveys are conducted weekly year round. Water control structures at the Strand property (Sudbury) and Concord impoundments (Concord) will be maintained to allow refuge staff to manage water levels in the pools. Flooding areas dominated by seed-producing annuals provide carbohydrates and fat for the higher maintenance requirements of dabbling ducks during fall migration and winter. To obtain the desired feeding habitat, water levels are drawn-down in alternating pools in Concord during the summer to promote germination of wetland plants. These pools are then slowly flooded during the fall and early winter, ensuring that water depths in areas with annual plants do not exceed eight inches. Slow staging of water levels provides a continual supply of new habitat at optimal levels.

Air Quality

The State air quality report from 2002 contains the most recent data available from the Massachusetts Department of Environmental Protection (MADEP), Air Assessment Branch. The report contains data for several different pollutants: ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), Carbon Monomoxide (CO), and particulate matter (10 microns (PM10) and 2.5 microns (PM2.5)). Data for O_3 and PM2.5 is available from the monitoring site in Stow; SO_2, NO_2, CO and PM10 data are from Worcester. Massachusetts levels for CO, SO_2, PM2.5, and PM10 are below the U.S. Environmental Protection Agency (USEPA) standards for these pollutants.

Winterberries frozen in winter: Photo by Marijke Holtrop

There are two ozone standards based on two different averaging times, 1-hour and 8-hour. For almost two decades prior to 1997, the standard for ozone had been 0.12 parts per million (ppm) averaged over one hour. In 1997, USEPA set a new stricter ozone standard of 0.08 ppm averaged over an eight-hour period. Industry groups filed suit against USEPA following promulgation of the standard. In February 2001, the U.S. Supreme Court upheld the USEPA's authority for setting the new health-based ozone and particulate matter standards. In March 2002, the U.S. Court of Appeals for the District of Columbia upheld the standards themselves. However, the USEPA has not yet designated ozone nonattainment areas for the new 8-hour standard due to the delay in implementation of the new standard caused by the industry litigation. MADEP monitors for both 1-hour and 8-hour ozone levels throughout the state. Massachusetts has violated the 1-hour ozone standard for many years. However, with the adoption of numerous control programs, progress has been made. The number and severity of the 1-hour ozone exceedances has declined significantly in recent years. As of 2002, the entire state was in violation of the 1-hour and 8-hour standards based on ozone readings for the 1999-2002 period.

USEPA is expected to designate the attainment status of the state for the new 8-hour ozone standard in 2004. Massachusetts is expected to be nonattainment for the 8-hour standard.

In 2002, there were 122 exceedances of the 8-hour standard occurring on 30 days, and 22 exceedances of the 1-hour standard occurring on 5 days on a state-wide basis. A total of six 8-hour exceedances were recorded in 2002 in Stow. The trends for ozone readings in the state have been generally decreasing toward better quality since 1988.

Massachusetts has made significant progress in attaining the CO standard by implementing air pollution control programs. The last violation of the CO National Ambient Air Quality Standards (NAAQS) occurred in Boston in 1986. The Boston Metropolitan area was redesignated to attainment of the CO Federal air quality standard by the USEPA in 1996. Lowell, Springfield, Waltham, and Worcester were redesignated to attainment of the CO standard by the USEPA in 2002.

In recent years there has been concern regarding the aerial deposition of mercury from atmospheric sources outside the northeast region (see for example Sweet and Prestbo 1999). Researchers have speculated that this may be the source of mercury levels found in some species and age-classes of fish in New England above the 1 part per million standard established by the U.S. Food and Drug Administration.

The annual average concentration of lead in the air decreased substantially since 1985 from more than 300 ug/m^3 to less than 0.05 ug/m^3 (the annual average NAAQS for lead is 1.5 ug/m^3). Massachusetts is well below the standard. This result is attributed to the use of unleaded gasoline in motor vehicles, which are the primary source of airborne lead emissions (MADEP 2000). While air quality concentrations of lead have dramatically decreased, there may still be concern regarding residual lead levels in soils along heavily traveled roadways deposited prior to the change to unleaded gasoline usage.

Redwing Blackbird chicks: Staff photo

Water Quality and Quantity

The SuAsCo River basin is one of the fastest-growing areas of the state; consequently, water quality has suffered. The primary water quality classification for both the Sudbury and Assabet rivers is Class B, warm water fishery. The primary water quality classification for the portion of the Concord River in the refuge is Class B, warm water fishery, treated water supply (MEOEA 1996). The Commonwealth of Massachusetts defines Class B waters as being suitable for "protection and propagation of fish, other aquatic life, for wildlife, and for primary and secondary contact recreation." (MADEP 1998a)

Multiple point sources of pollution heavily impact water quality in the Sudbury River: one wastewater treatment plant; the contamination from both the Nyanza Superfund site and the Raytheon Brook site; and, the Marlborough Easterly Wastewater Treatment Plant, which discharges into the Sudbury River via Hop Brook (MEOEA 1996). The town of Hopkinton proposes to build a wastewater treatment plant as well (Nancy Bryant, SuAsCo Watershed Community Council, pers. comm). We have provided specific information about the contamination from the Nyanza Superfund site and the Raytheon Brook site in "Contaminants" below. Non-point sources also pollute the Sudbury River. Those include pesticides, fertilizers, and storm water and parking lot runoff.

Wetland habitat: Photo by John Grabill

The Assabet River is the one most heavily impacted by point source pollution. Six wastewater treatment plants in Westborough, Marlborough (Marlborough Westerly), Hudson, Maynard, Acton, and Concord are now operating, and another one is proposed in Acton. As with the Sudbury River, many non-point sources of pollution also degrade water quality in the Assabet River.

The Concord River has three wastewater treatment plants operating on its banks: one in Concord and two in Billerica. Although the two plants in Billerica lie downstream of the refuge, their impact on the river cannot be overlooked. The treatment plant in Concord lies just upstream of the Concord impoundments on the refuge. As with the Sudbury and Assabet rivers, non-point source pollution also impacts the Concord River (MEOEA 1996).

The public is very interested in protecting the resources in this watershed, as indicated by the establishment of the SuAsCo Watershed Community Council. The nonprofit group is composed of representatives from business and industry, municipal governments, environmental organizations, and state, federal, and regional agencies.

Aircraft Noise

Noise is a constant disturbance at the Concord impoundments; planes from Hanscom Field in Bedford fly directly over the refuge. Hanscom Field is the busiest general aviation airport in New England, with more than 200,000 operations per year. Corporate jet traffic amounts to 12 percent of the air traffic leaving Hanscom Field, and that percentage is growing by 22 percent per year. Corporate jets create as much noise as regular jet-airliners (Save Our Heritage 1999).

Contaminants

Elevated levels of heavy metals (mercury, lead, and arsenic) are present at many locations in the Sudbury River. The effects of those metals on wildlife are unclear. Other heavy metals are present as well, including cadmium and chromium. Their effects also are unknown. There are some indications that levels of mercury, while below levels that would affect fish or piscivorous fish, possibly may be high enough to affect piscivorous birds. The Nyanza Superfund site in Ashland and the Raytheon brook wetlands in Sudbury are two major sources of pollution near the refuge. Both sites have introduced mercury into the Sudbury River (Eaton and Carr 1991).

Concentrations of polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs) in sediments in the vicinity of the Raytheon site are high. The PCB and PAH concentrations for the Sudbury River overall do not appear to represent a significant hazard to piscivorous birds, but could adversely affect highly susceptible mammals, such as mink (*Mustela vison*). No other organochlorine pesticides surveyed appear to represent significant hazards to the Sudbury River (MEOEA 1996 and Eaton and Carr 1991).

In September 1994, the Massachusetts Department of Public Health issued a state-wide interim freshwater fish advisory because of elevated mercury levels in certain species of freshwater fish. The interim advisory recommends, "pregnant women should be advised of the possible risk from eating fish in Massachusetts freshwater bodies in order to prevent exposure of developing fetuses to mercury." This advisory does not include stocked trout or farmraised fish sold commercially (MEOEA 1996).

Special Designations

Wild and Scenic River Designation

In April 1999, Congress included 29 miles of the Sudbury, Assabet, and Concord rivers within the National Wild and Scenic Rivers System (NWSR), in recognition of their outstanding ecology, scenery, recreation value, and their place in American history and literature. Those 29 miles are further sub classified as 14.9 miles scenic and 14.1 miles recreational. The refuge is located along some of the 14.1 miles classified as scenic on the Sudbury River and along some of the 8-mile segment of the Concord River designated as recreational. Descriptions of where the designated Concord and Sudbury Rivers flow through the refuge are provided below.

- The NWSR designation of the Sudbury River begins at the Danforth Street Bridge in Framingham, 13.2 miles downstream to the Route 2 Bridge in Concord, thence 1.7 miles to its confluence with the Assabet River at Egg Rock.
- The NWSR designation of the Assabet River begins 1,000 feet

downstream from the Damon Mill Dam in Concord, 4.4 miles to its confluence with the Sudbury River at Egg Rock.
- The NWSR designation of the Concord River begins at the confluence of the Sudbury and Assabet rivers, 8 miles downstream to the Route 3 Bridge in Billerica.

The goal of any National Wild and Scenic River designation is to preserve the character of a river, not to curtail its use or halt further development. Uses that are compatible with the management goals for a designated river are allowed. Usually, development that does not damage the resources of a designated river or curtail its free flow is allowed (www.nps.gov/rivers/wsract.html).

The Sudbury River at Weir Hill: Staff Photo

Portions of Great Meadows NWR are included in the designated Sudbury Valley Important Bird Area (IBA). IBAs provide essential habitat for at least one or more species of breeding, wintering or migrating birds. The program highlights these important areas, but is not regulatory in nature. The primary goals of the program are listed below.
- "To identify, nominate and designate key sites that contribute to the preservation of significant bird populations or communities.
- To provide information that will help land managers evaluate areas for habitat management or land acquisition.
- To activate public and private participation in bird conservation efforts.
- To provide education and community outreach opportunities."

(http://www.massaudubon.org/birds-&-beyond/iba/iba-intro.html)

Biological Resources

Vegetation and Habitat Types

Wetlands

Along the Sudbury and Concord rivers, scrub–shrub wetlands predominate. Extensive buttonbush-dominated (*Cephalanthus occidentalis*) wetlands reflect long-term vegetational changes along both rivers. In many areas, invasive species, such as water chestnut (*Trapa natans*) or purple loosestrife (*Lythrum salicaria*), have displaced plant species of high waterfowl value, such as bur-reed (*Sparganium sp.*) and bulrush (*Scirpus palustris*). Despite having low food source value for waterfowl, these wetlands still provide excellent brood cover. Less prevalent along the rivers are valuable "sedge meadows," which are dominated by non-woody vegetation, including extensive areas of bulrush and cord grass (*Spartina pectinata*), with beds of water pepper (*Polygonum hydropiper*), wild rice (*Sizania aquatica*), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), and smartweed (*Polygonum amphibium*). These meadows are especially attractive to

waterfowl. All wetland areas are typically flooded in spring; their water levels gradually decline throughout the summer.

Forested wetlands make up about 8 percent of the refuge. The dominant trees and shrubs in their overstory are red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), hemlock (*Tsuga canadensis*), sweet pepperbush (*Clethra alnifolia*), white swamp azalea (*Rhododendron viscosum*), and rosebay rhododendron (*Rhododendron maximum*). Herbaceous plants found in these areas include skunk cabbage (*Symplocarpus foetidus*) and jack-in-the pulpit (*Arisaema spp.*).

Foxtail: Photo by Emily Ann Hollick

Dense stands of cattail (*Typha latifolia*) and purple loosestrife dominate the edges of the Concord impoundments. Vegetation within the impoundments varies depending on the water level management. In years when the impoundments are kept flooded as pond habitat, common littoral emergents include arrow arum, arrowhead (S*agittaria sp.*), bur-reed, wild rice, pickerel weed, sweet flag (*Acorus calamus*), and smartweed. In years when the impoundments are drained in the spring, common vegetation includes Walter's millet (*Echinochloa walteri*), *Cyperus spp*. and Wild Rice.

Uplands

Uplands compose about 20 percent of the refuge. They form critical edges between refuge wetlands and the suburban development adjacent to them. Most of the uplands were once farmed. Many areas have grown into solid stands of white pine. Other areas now support species typical of a mixed eastern deciduous forest. Dominant species in the forested upland include red maple, red and white oak (*Quercus rubra; q. alba*), white pine (*Pinus strobus*), blueberry (*Vaccinium spp.*), sweet pepperbush, rosebay rhododendron, and sweet fern (*Comptonia peregrina*). Common species found in the open fields include common milkweed (*Asclepias syriaca*) and goldenrod (*Solidago spp.*).

The refuge now manages approximately 200 acres of discontinuous field habitat (~12 different fields). Dense stands of hardwood are gradually replacing other fields in the uplands. All the fields are bordered by brush edges that, in most places, change into mature deciduous woodlands. Songbirds and small mammals use these edges extensively. The fields provide dense nesting cover for some grassland bird species, such as Eastern meadowlark (*Sturnella magna*), savannah sparrows (*Passerculus*

sandwichensis) and Bobolinks (*Dolichonyx oryzivorus*). Male American woodcocks also use the fields as "singing grounds" for their courtship displays in the spring.

One six-acre field had been cooperatively farmed for several years, but has not been farmed since 2002. The field is generally wet and is not high producing farmland.

Invasive Plants

Japanese Knotweed: Photo by Marijke Holtrop

Several species of non-native invasive plants have invaded wetlands an upland habitat on the refuge: water chestnut, purple loosestrife, Asiatic bittersweet (*Celastrus orbiculatus*), common reed (*Phragmites australis*), Japanese knotweed (*Polygonum cuspidatum*), glossy buckthorn (*Rhamnus alnifolia*), tree of heaven (*Ailanthus altissima*), autumn olive (*Eleagus umbelleta*), and black locust (*Robinia pseudo-acacia*). Water chestnut and purple loosestrife are found in the Concord impoundments and along both the Sudbury and Concord rivers.

Wildlife Resources

Migratory Birds

The refuge provides a mix of wetland, upland field, scrub-shrub, and forested habitats. This combination provides excellent habitat for a variety of bird species year-round. A number of state-listed species are found on the refuge during various seasons. For a complete list of avian species that are known to use the refuge, see Appendix D.

Many species of birds stopover at the refuge during spring and fall migration. Peregrine falcons (*Falco peregrinus*) and bald eagles (*Haliaeetus leucocephalus*) are occasionally seen flying over the refuge during fall migrations. The northern harrier (*Circus cyaneus*), often seen hunting at the Concord impoundments, is listed as threatened by the NHESP.

Many songbird species nest, feed, and rest on the refuge. They include marsh wren (*Cistothorus palustris*), gray catbird (*Dumetella carolinensis*), yellow warbler (*Dendroica petechia*), redwinged blackbird (*Agelaius phoeniceus*), swamp sparrow (*Melospiza georgiana*), common yellowthroat (*Geothlypis trichas*), yellow-rumped warbler (*Dendroica coronata*), and northern mockingbird (*Mimus polyglottos*). A number of bird species nesting on or migrating through the refuge are neotropical migrants (these species winter in Central and South America). As a group, neotropical migrants have shown recent population declines due to habitat deterioration and loss in wintering areas and along migration corridors.

Thousands of waterfowl, over 20 different species, use the refuge throughout the year. Common species include green-winged teal (*Anas crecca*), American black duck (*Anas rubripes*), wood duck, and mallard (*Anas platyrhynchos*). Species less commonly observed include northern shoveler (*Anas clypeata*), blue-winged teal (*Anas discors*), hooded merganser (*Lophodytes cucullatus*), and gadwall (*Anas strepera*).

Canada Geese: Photo by Paul Buckley

Many marsh and water birds use the refuge, particularly the Concord impoundments. The most common are great blue heron (*Ardea herodias*), great egret (*Ardea alba*), Virginia rail (*Rallus limicola*), and green heron (*Butorides virescens*). The pied-billed grebe (*Podilymbus podiceps*), a state-listed endangered species, is a common sight on the Concord River or in the impoundments in the summer and early fall. Less common species found at the impoundments and other wetlands on the refuge include sora rail (*Porzana carolina*), and American bittern (*Botaurus lentiginosus*). The least bittern (*Ixobrychus exilis*), also a state-listed endangered species, historically has nested on the refuge.

Shorebirds are generally seen at the Concord impoundments during fall migration. Species frequently seen include killdeer (*Charadrius vociferus*), least sandpiper, greater and lesser yellowlegs (*Tringa melanoleuca, T. flavipes*), pectoral sandpiper (*Calidris melanotos*), and semi-palmated plover (*Charadrius semipalmatus*). Less common species include white-rumped sandpiper (*Calidris fuscicollis*), and black-bellied plover (*Pluvialis squatarola*).

Mammals

No formal surveys or inventories have been conducted on the refuge for mammals. However, many mammal species are found on the refuge: Virginia opossum (*Didelphis virginiana*), several shrew species (*Sorex spp.* and *Blarina spp.*), chipmunks (*Tamias striatus*), eastern gray squirrel (*Sciurus carolinensis*), flying squirrel species (*Glaucomys spp.*), white-tailed deer (*Odocoileus virginianus*), muskrat (*Ondatra zibethica*), mink (*Mustela vison*), coyote (*Canis latrans*), red fox (*Vulpes fulva*), fisher (*Martes pennanti*) and American beaver (*Castor canadensis*). For a complete list of mammals likely to be present, see Appendix D.

Reptiles and Amphibians

Comprehensive inventories of amphibians and reptiles have not been conducted. We have conducted the Service Northeast Region Anuran Call Count Survey for the refuge. The survey is designed to identify frog and toad species of the refuge and monitor their populations. Frog and toad species on the refuge include green frog (*Rana clamitans cl.*), bullfrog (*Rana catesbiana*), northern spring peeper (*Pseudacris crucifer*), pickerel frog (*Rana palustris*), gray tree frog (*Hyla versicolor*), northern leopard frog (*Rana pipiens*), wood frog (*Rana sylvatica*) and American toad (*Bufo americanus*).

Bullfrog: Photo by Ken Andrews

Reptile species found on the refuge include snapping turtle (*Chelydra serpentina*), state-listed Blanding's turtle (*Emys blandingii*), eastern box turtle (*Terrapene carolina carolina*), common garter snake (*Thamnophis sirtalis*), eastern ribbon snake (*Thamnophis sauritus*), and northern water snake (*Nerodia sipedon*). For a complete list of amphibians and reptiles, see Appendix D.

Fish

Similar fish species appear in the Concord and Sudbury rivers. Common species include northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), brown bullhead (*Ictalurus nebulosus*), rainbow trout (*Salmo gairdneri*), and pumpkinseed (*Lepomis macrochirus*). A cooperative recovery program, now underway for the alewife (*Pomolobus pseudoharengus*), will continue for the next several years. Service personnel from the Central New England Fishery Resources Office and volunteers have released alewife into the Concord River. The alewife recovery program has met with success in efforts at restoration. In June 2004, juvenile alewife were successfully collected from Heard Pond. For a complete list of species, see Appendix D.

Invertebrates

No formal surveys have been conducted on the refuge for invertebrates. Invertebrates are not well documented. A number of varied invertebrates, both terrestrial and aquatic, are of biological importance. Lepidopterans are frequently observed (see Appendix D).

Threatened and Endangered Species

No federal-listed endangered or threatened species reside on the refuge. Bald eagles are occasionally seen over the Concord impoundments.

Cultural Resources

Prehistoric Period

Recorded prehistoric archeological sites and artifact "find spots" show that prehistoric occupation in the SuAsC drainage system spans 11,000 years. The first Native American occupation in this area occurred during the Paleoindian period (11000–8000 Before Present (B.P.)). While no definite Paleoindian sites have been reported within the boundaries of the refuge, a diagnostic Paleoindian fluted point of unknown type was reported as an isolated find spot in the Sudbury drainage (Dincauze and Mulholland 1977:440).

The early Archaic period (9000–7000 B.P.) follows the Paleoindian. Small, widespread populations that practiced diversified hunting and gathering characterize the Early Archaic culture. The diverse flora and fauna associated with the wetlands in the refuge would have supported this type of subsistence strategy. Several Early Archaic sites containing bifurcate-base projectile points lie within the Refuge boundary. They include areas around Heard Pond (SUD-028P, MA State #19-MD-207, 208, 209) south of the Headquarters Tract in Wayland, and the Davis Farm Site, located along Pantry Brook north of the Headquarters Tract. Ritchie's reports discuss in detail the Early Archaic materials found not far from those areas (Ritchie 1980, 1985; Ritchie and Davin 1984).

During the Middle Archaic period, (8000–4500 B.P.), hunters and gatherers focused their subsistence strategies on drainage systems. Fishing gear appeared during that time, and people heavily used local sources of stone. The refuge environment was ideal for the people of the Middle Archaic. Several Middle Archaic sites near the refuge are known. Ritchie argues that the Sudbury and Concord rivers drainage in eastern Massachusetts was a major focus of Middle Archaic activity (Begley and Ritchie 1998; Ritchie 1985). The settlement patterns of the Middle Archaic people suggest an intricate population distribution that ranges in site size and internal complexity. Several small sites in upland settings contrast sharply with known larger riverine zone sites, like the Heard Pond Middle Archaic complexes, which suggest functional diversity of site settlement patterns. Also, the tool kits associated with the various sites are functionally diverse. These include chipped and ground stone tools (usually associated with the production of plant foods), gouges, choppers, and net sinkers. That diversity may indicate that the Middle Archaic people traveled within river drainage territories and upland areas to exploit seasonal resources (Ritchie 1985; Dincauze 1976:136).

The lithic materials during the Middle Archaic period were primarily from local sources. Local Westboro formation quartzite or mylonite and rhyolite or felsite from sources in the blue hills and Charles-Neponset river drainage area dominate Neville phase sites. Other Middle Archaic materials that dominate the stone assemblages of the sites in the refuge area include both local and non-local sources. The non-local sources include quartzite, crystal tuff, and amphibolite schist or argillite from source areas in the Charles River drainage and, occasionally, chert from New York State. Middle Archaic people quarried the local quartzite, mylonite, crystal tuff, and amphibole schist from bedrock outcrops in upland sections of the Sudbury-Assabet drainage (Ritchie 1985).

Following the Middle Archaic is the Late Archaic period (4500–3000 B.P.), at the onset of the Terminal Archaic period. Intensive hunting and gathering over a large region characterized the Late Archaic. People also began to exploit freshwater and saltwater shellfish. The Late Archaic population may have been the largest for the Archaic period (Ritchie 1985).

Late Archaic cultural complexes show the greatest frequency and widest distribution in different environmental zones. Surface collections from the larger, multicomponent sites along the Sudbury River drainage contain projectile points diagnostic of the three major cultural traditions which are Laurentian/Brewerton-Vosburg, small stem point, and Susquehanna (Ritchie 1985). Several Late Archaic projectile points have been recovered at the Headquarters Tract. These include Brewerton eared notched projectile points, small-stemmed and triangular projectile points. Artifacts recovered from the Late Archaic sites include hunting tools (projectile points, bifacial knives), woodworking tools (full-grooved axes, adzes, gouges, whetstones) and processing tools (pestles, scrapers, hammerstones, soapstone cooking vessels).

Sunset at Great Meadows: Photo by David Margaretos

To summarize, people during the Late Archaic intensely exploited the habitats within the refuge. Diverse tool assemblages and relatively large population densities characterized this period. As in the Early and Middle Archaic, there was much activity on the refuge during the Late Archaic. The intense use of resources in the immediate area does not appear to decrease during the Transitional Archaic period and the Woodland periods.

The Transitional Archaic (3600–2500 B.P.) was characterized as economically similar to the Late and Middle Archaic, but more groups may have been migrating into New England, or more local groups may have been developing technologies strikingly different from those previously used (Ritchie 1985). Trade in materials such as soapstone became important, and burial rituals became more complex,

perhaps due to an increase in population size. Very often, Transitional Archaic sites are placed in the same category as Early Woodland, because there is much overlap among projectile point styles, and no other attributes clearly distinguish the two cultural periods. The dates given for the Early Woodland are 2600 to 1,500 B.P. during the Early Woodland, clay pottery began to appear. This may correlate with early horticultural efforts by New England populations.

Wood Frog eggs: Photo by Marijke Holtrop

In the refuge area, diagnostic Orient Fishtail and Meadowood projectile points were in collections from most of the large riverine multi-component sites. Meadowood points made of non-local chert from the Headquarters Tract show that the use of the Weir Hill area continued through the Archaic into the Woodland period (Ritchie 1985). Most of the site locations used during the Terminal Archaic/Early Woodland period continued to be staging points for Middle Woodland resource exploitation. Significant reuse of other sites that people used during the Middle and Late Archaic also occurred (Ritchie 1985).

Coastal resources were important for people of the Middle Woodland period (1650 B.P.–1000 B.P.). Horticulture of local northern plants, such as *Chenopodium*, became increasingly important; however, gathering and hunting were still the main subsistence means.

The Late Woodland is an extension of the Middle Woodland. The Late Woodland begins at 1000 B.P. and ends with the arrival of Europeans in New England. During the Late Woodland, horticulture of local domesticates intensified and neighbors to the south and west introduced maize horticulture. People lived in larger groups, and sometimes in fortified villages. During this period, complex political alliances emerged, perhaps reflecting an increase in sedentary lifestyle and population growth. This was most evident in coastal areas. Some inland groups may have continued a more mobile hunting and gathering subsistence strategy.

Middle and Late Woodland settlement patterns near the refuge were similar, with a possible reduction in resource exploitation territories during the Late Woodland period. Many site locations at Weir Hill, Heard Pond, and around the Rice Tract were fishing stations during these periods (Ritchie 1985:40).

The complex political structures that emerged during the Late Woodland collapsed due to European expansion and disease. During this time, projectile points made from metals traded to the Native Americans by the Europeans emerge. Other European materials were also adapted to suit Native American needs and ideologies. No contact period sites have been identified on the refuge or in the immediate vicinity. However, people may

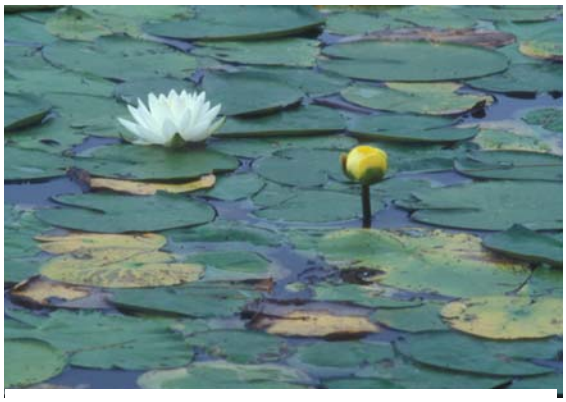
have used the fishing weir that gave Weir Hill its name.

The refuge has significant potential to contribute to our understanding of prehistoric settlement patterns in Eastern Massachusetts. The ecology of the area certainly played a significant role in the development of the cultures in this area, as did human impact on the environment. The refuge area was a "highway" for people during the Middle Archaic through the Woodland periods, and continued to be important for people during the Historic Period.

The Historic Period

People used the Headquarters Tract for agricultural and pastoral purposes over the last 350 years. Extant remains of this type of lifestyle are still visible, including remains of agricultural land use patterns, farm dump areas, abandoned fields, former roadways, stone walls, fence lines, and drainage or boundary ditch systems. The refuge area was settled in the early part of the 17th century, soon after Plimouth Colony.

By 1640, Sudbury was settled, and had a unique political and economic structure. The town practiced an open field system. These commons surrounded the town center, with about 2,750 acres on the east side of the river, and 5,000 acres to the west, extending to Pantry Brook. These commons were used mostly for cattle, except for 50 acres of upland near Hop Brook that were used for a mill in 1659. The primary crops grown by the early settlers were corn, rye, barley, wheat, peas, oats, hemp, and flax. Hay was also grown along river meadows.



Water and pond lilies: Photo by Marijke Holtrop

Several Historic Period Christian Indian towns were located outside the perimeter of English frontier towns like Sudbury and Concord. The Indian town of Ockookamkomesit eventually became the English plantation of Marlborough between 1650 and 1660. Most of these Indian towns were diminished by European-introduced diseases and, later on, by warfare.

During the 18th century, the primary changes in the town were a population increase, the establishment of a militia, and the Revolutionary War. Also, several roads and bridges were constructed, which allowed for more commerce between the surrounding towns and Boston.

In 1780, the East and West Precincts of Sudbury were divided into two towns. The Sudbury River formed the town line between East Sudbury and Sudbury. By 1794, a report on the town of Sudbury described three grist mills, two saw mills, and a fulling mill as local industries; all were located along the Wash Brook and Hop Brook drainage (Ritchie 1985).

During the 19th century, the village of South Sudbury developed into a commercial district known as Mill Village, with a church, town library, post office, general store, and malt house. Several small industries, including a grist mill, blacksmith, machine shop, wheelwright's shop, tannery, and a shoe factory were located near a mill pond on Hop Brook. The Framingham and Lowell railroad was extended through South Sudbury in 1870. Ten years later, the Massachusetts Central Railroad formed a junction with the Framingham and Lowell at South Sudbury, and a railroad station was built for regular use (Ritchie 1985).

Sudbury Center continued as a focus of community activity in the 19th century with a town hall, three churches, school houses, stores, railroad depot, and close to fifty houses. The district on North Sudbury remained open farmland throughout the nineteenth century with a small station on the Old Colony Railroad (Ritchie 1985).

Mining of bog iron from the swamps in the north part of Sudbury was also an important small-scale rural industry during the 19th Century. The bog iron ore was carted to the Sudbury River where it was loaded onto barges and transported to forges in Chelmsford (Ritchie 1985).

Around the refuge area, the primary activity for all Historic periods until the late 20th century has been farming. Several farm archeological sites located on the refuge date back to the early settlement of the area. More recently, a summer camp called the Elbanobscot Environmental Education Center built in the 1950's stood on what is now refuge land. The summer camp altered the Weir Hill area by constructing a swimming pond on the edge of the Sudbury River floodplain, near the present-day headquarters building and a leaching field on top of Weir Hill (Ritchie 1985).

The refuge offers an excellent opportunity to study early American history. Several important cultural resources located on the refuge potentially can contribute significant information about human activity there over the last 10,000 years. The archeological studies now completed have yielded important information. Other archeological resources still undiscovered also may exist on the refuge.

Socio-economics

Bedford

Bedford is located 15 miles northwest of Boston, between Billerica to the north and Concord and Carlisle to the west. Its total land area is 13.87 square miles. Its population increased by 1 percent from 13,067 in 1990 to 13,947 in 1998. Middlesex Community College, the Edith Nourse Rogers Memorial Veterans Hospital, Hanscom Air Force Base, and other businesses in Bedford employ about 23,000 persons.

Founded in 1729, Bedford has retained both its natural and architectural beauty. Visitors find an attractive historic district and town common in the center, the famous Bedford Flag on display in the library, the 1790 Job Lane house, and several national historic landmarks. Annual town celebrations include "Pole Capping" in April, when the Bedford Minuteman Company reenacts a Revolutionary-era tradition, and "Bedford Day" in September, celebrated with a parade, street fair, and dancing.

Bedford residents enjoy many town services. Education is a top priority, with schools well known for scoring competitively by all standards. The library serves everyone, and has active children's programs. All age groups enjoy recreation programs, including after-school day-care, a summer day camp, and a senior center offering daily health and leisure services. An in-town minibus runs weekdays. Outdoor facilities include a swimming pond, a lake for boating, a bike path to Cambridge, and walking trails through conservation lands.

Trail: Photo by Stanley Klein

Billerica

Billerica is located 20 miles northwest of Boston, and has a population of 40,000 residents (1998). That population has grown only 1.1 percent over the 1990 Census figures. Its total land area is 26.39 square miles; and although much of Billerica has been developed, significant parcels of vacant land still lend a certain rural character to many areas of town. Remnants of the historic Middlesex Canal, which once connected the Merrimack River to Boston, traverse the town north to south. Two rivers pass through town: the Concord River is a major regional water feature; the Shawsheen River meanders through the southern part of town.

Incorporated in 1655, Billerica remained predominately agricultural until the mid-nineteenth century, when a major mill complex was sited on the Concord River in North Billerica. Although a number of smaller industries grew up over the next 100 years, it was not until the 1950's that the present-day industrial base was established. Today, Billerica is a major regional employer, and home to several high technology firms, some of which are offshoots of companies along Route 128 to the south. Billerica is also the site of the Middlesex House of Correction, a significant town employer.

Carlisle

The Town of Carlisle offers peaceful residential living within 20 miles of Boston. The 1998 population of 4,760 has increased only 1.1 percent since 1990. Although the town is primarily residential, a few businesses are located there. Carlisle maintains a rich tradition in preserving open space and scenic ways; almost 20 percent of the town's 15 square miles is

dedicated conservation land. The only working cranberry bog in Middlesex County is located in Carlisle. The state owned and managed Great Brook Farm State Park offers numerous hiking trails, and vistas of open fields.

Concord

The junction of the Concord, Sudbury, and Assabet Rivers historically was the site of seasonal Native American camps, because of plentiful runs of shad, salmon, and herring. The English settled Concord as an early frontier outpost of the Massachusetts Bay Colony. Named in 1635, the historic town of Concord lies west of present-day suburban Boston. It was the first non-tidal-water town in interior Massachusetts. Concord retains many well-preserved colonial houses: nine of them stood near Concord green during the battle that opened the Revolutionary War.

Concord also has a significant literary history, having been the home of the leaders of the intellectual movements of 19th century America. Louisa May Alcott, Bronson Alcott, Ralph Waldo Emerson, and Nathaniel Hawthorne lived in Concord at one time, and Henry David Thoreau wrote his internationally known philosophical treatise at Walden Pond in Concord.

Concord is located 18 miles west of Boston, and comprises 26 square miles. Several major roadways, Routes 2, 128, and I-95, are easily accessible from Concord. Since 1990, the town's population has grown one percent, from 17,076 to 17,867. The town is a mix of residential neighborhoods, retail centers, and high-tech industry. Skyrocketing land prices in the real estate boom of the 1980's resulted from Concord's proximity to Boston and the Route 128 technical and industrial corridor, coupled with a vigorous regional economy. Concord residents feel that its tourism and rapid suburban development are placing considerable pressure on the town.

Framingham

The Town of Framingham, located 19 miles from Boston and midway between Boston and Worcester, is the hub of the Metro-West region. The town's total land area is 26.44 square miles, and its population in 1998 was 64,646. That estimate is down 1 percent from 1990.

Framingham offers a unique blend of urban and rural qualities. The vibrant retail area along Route 9 lies close to quiet residential areas and the town common. The historic strengths of the town have been its location and its people. From its founding in 1700, Framingham has supported a variety of industries. The mills and factories that flourished in Framingham encouraged the growth of the Saxonville area of the town and the downtown.

The major employers now are primarily non-manufacturing, including medical, retail, educational, office, and biotechnical. Framingham offers a

variety of recreational activities for its residents, from its many organized team sports leagues to the nationally renowned Garden in the Woods. Residents unite for numerous municipal celebrations throughout the year, with a major focus on Flag Day in June.

Lincoln

The Town of Lincoln is a small suburb 13 miles northwest of Boston. It began as a rural farming community made up of pieces of land "nipped" from adjacent towns; hence, its nickname was once Niptown. The town also became a popular site for country estates, some of which have become schools, museums, town buildings, or parks. Lincoln's total land area is 15.01 square miles. Its population is 7,921, up 1 percent since 1990.

Retaining open space and protecting its rural character against encroaching urban development are extremely important to the community. To that end, Lincoln was one of the first towns to create a Conservation Commission that has, with the Lincoln Land Conservation Trust, acquired key parcels of land throughout the town. Significant areas of the town are now preserved against development, providing protection for wildlife and local water supplies, and creating conservation trails for public use.

Sudbury

We have excerpted here information provided by John Powers, former Sudbury town selectman. Sudbury has roots deep in American history. Like other local towns, Sudbury was home to the Nipmucks of the Algonquin nation before European settlement. The colonial history of Sudbury is actually the history of Sudbury Plantation, which was first settled by Europeans in 1638 in what is pleasant day Wayland. The town center remained in present-day Wayland until 1780, when the town split into Sudbury and East Sudbury (now Wayland)

Wild Mushroom: Photo by Marijke Holtrop

Townsmen developed not merely a new community but a new concept: government with the consent of the governed. Sudbury's role in the development of the town meeting form of government, and its insistence upon the direct right of a citizen to choose his governors and to make himself heard upon any issue in open forum, did much to lay the foundation of American democracy.

As the first highways, such as Boston Post Road, were constructed, Sudbury developed the small local businesses of a self-sufficient community. There were shoe shops and blacksmiths, tanners and wheelwrights, nail factories, and saw mills. Quiet agricultural growth continued into the

1940's, but as Boston grew, so too did Sudbury, only 20 miles from the burgeoning Boston.

Today, at 24.7 square miles, Sudbury is a bustling mix of residential and retail areas and light industry. The residential areas lie beyond the retail and light industry centered along Boston Post Road. The 1998 population of Sudbury was 15,550. Many commute to Boston or to the Route 128 high-tech corridor.

Wayland

The Town of Wayland, 18 miles west of Boston, was the original 1638 settlement of Sudbury Plantation, which also encompassed most of present-day Sudbury and parts of present-day Framingham. The town was founded to take advantage of the lush grazing resources available along the floodplain of the Sudbury River. Today, this historic land is virtually all either refuge land or Wayland conservation land. The Saxonville area became part of the new town of Framingham in 1700. Present-day Sudbury and present-day Wayland separated in 1780, with the newly formed town retaining the Sudbury name. The 15 square miles of present-day Wayland took the name of East Sudbury and became Wayland in 1835. The Wayland name is thought to be in honor of Reverend Francis Wayland, former president of Brown University, who donated funds to establish the town's first free public library in 1848. The town remained primarily agricultural from its founding through World War II, except for a thriving shoe industry, which developed around Cochituate Village in the late 19th century and faded in the early 20th century. After World War II the town developed into an affluent bedroom community within easy commuting distance of Boston and the high-tech corridors of Routes 128 and 495 and contains very little industry or commercial activity. Between 1990 and 1998, its population grew by 1 percent, from 11,874 to 12,343.

Wayland's quiet, handsome neighborhoods of spacious homes have been enhanced by its townspeople having funded the purchase of land to maintain open space. The town maintains a municipal beach on the shore of scenic Lake Cochituate. The preservation of open space by the refuge also has aided the town in retaining its rural character.

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Chapter 4: Management Direction

The Service manages fish and wildlife habitats considering the needs of all resources in decision-making. A requirement of the Refuge Improvement Act is to maintain the ecological health, diversity, and integrity of refuges. The refuge is a vital link in the overall function of the ecosystem. To offset the historic and continuing loss of riparian and forested floodplain habitats within the ecosystem, the refuge helps to provide a biological "safety net" for migratory non-game birds and waterfowl, threatened and endangered species, and other species of concern.

The vision and goals of Great Meadows NWR translate the Refuge System, Mission and Refuge Purposes into management direction. To the extent practicable, each goal is supported by objectives with strategies needed to accomplish them. Objectives are intended to be accomplished within 15 years, although actual implementation may vary as a result of available funding and staff. As one of the eight refuges in the Complex, Great Meadows NWR is a vital part of the following vision and goals.

Complex Vision

The Complex will contribute to the mission of the Refuge System and support ecosystem–wide priority wildlife and natural communities. Management will maximize the diversity and abundance of fish and wildlife with emphasis on threatened and endangered species, migratory birds, and aquatic resources. The Complex will have a well-funded and community-supported acquisition program which contributes to wildlife conservation. The refuges will be well known nationally and appreciated in their communities. They will be seen as active partners in their communities, school systems, and environmental organizations which will result in high levels of support for the refuges. The refuges will be a showcase for sound wildlife management techniques and will offer top-quality, compatible, wildlife dependent recreational activities. Refuges open to the public will provide staffed visitor contact facilities that are clean, attractive, and accessible, with effective environmental education and interpretation.

Complex Goals

The following goals were developed for the Complex to support the mission of the Refuge System and the Gulf of Maine Ecosystem Priorities. These goals provide a general management direction for the refuge. Each of the goals is followed by management objectives and strategies that will help refuge staff to meet the appropriate goals. The objectives and strategies that were developed as a part of this CCP do not adhere to the Service's guidelines for refuge goals and objectives. They are intended to provide a framework for management of the refuge. We look forward to refining

many of the goals, objectives, and strategies in our various step-down management plans.

Goal 1: Recover threatened and endangered species of the Complex.

Great Meadows NWR is not currently home to any federally listed threatened or endangered species. There are a number of state-listed species that occur on the refuge. Specific objectives and strategies that apply to Goal 2 will benefit these species. In the event that any federally listed threatened or endangered species are found on the refuge, we will take any necessary steps to ensure their protection.

Goal 2: Protect and enhance habitats that support self-sustaining populations of Federal trust species and wildlife diversity.

Objective 1: Collect and evaluate relevant baseline wildlife habitat data to ensure future decisions are based on sound science.

Strategy 1: Continue to participate in several region-wide and Service-wide surveys and studies, inventories of frogs, landbirds, shorebirds, marsh birds, and American woodcock. Breeding bird surveys are a top priority of the refuge. Participation in bird surveys and the national frog deformity project will continue as staff and funding allow. Current wildlife surveys are listed in Table 4-1.

Table 4-1: Wildlife Surveys at Great Meadows NWR

Survey	Purpose	Points	Observation	Other Information
Landbird Breeding Survey	• occurrence of species • occurrence within habitats • relative abundance • changes in population	Sudbury 21 Concord 22	late May to mid-June for 10 days 1 time/season observations made at 10 minute intervals	Survey points visited once during survey period, habitat is classified at each point began in 2000 birds are identified by sight and sound
Marshbird Callback Survey	• identify species presence • monitor change in abundance • evaluate species response to habitat modifications	20 points/unit in ponds, marshes, and emergent vegetation	Early May – mid July 3 - 5 times/season	began in 2000 birds are identified by sight and sound callback tapes are used
American Woodcock Survey	• presence and abundance	10 points in fields, clear cuts, meadows, etc.	mid-April – mid-July	re-established in 2000

Survey	Purpose	Points	Observation	Other Information
			observations conducted in 2 minute intervals 1 time/season	
Anuran Call Counts	• presence and abundance	11 points at Great Meadows	mid-March – mid-July 5 minute observation period 4 times/season	began in 2000
State-wide Annual Midwinter Bald Eagle Survey	• presence and abundance	1 survey route through refuge	January 1-15	Refuge participation since 1980
Waterbird Counts at Concord Impoundments	• Determine efficiency/success of water level manipulation	Concord Impoundments	weekly, year round	began 2000 4 year study in Concord impoundments
Rare Plant Surveys	• presence and abundance of rare plants	---	---	surveys conducted by New England Wildflower Society, MassWildlife, and MANHESP

Strategy 2: Update and expand current wildlife inventories to close data gaps related, in part, to: seasonality of use; habitat-type preferences; and, where practicable, estimates of population numbers. We will survey and inventory both the Service's Trust Resources (migratory birds and federally listed threatened and endangered species) and resident wildlife, including State listed threatened and endangered species. We expect to accomplish these concurrently; however, if necessary, surveys and inventories related to the Service's trust resources may receive priority.

Forest habitat: Photo by Karla Thompson

Strategy 3: Continue to monitor and seek to protect water quality. We will continue to rely on partners such as Concord River Environmental Stream Team (CREST), OAR and SVT to conduct this monitoring. However, we will actively participate in meetings with organizations such as the SuAsCo Watershed Community Council to ensure water quality protection throughout the watershed.

Strategy 4: Within 3 years, conduct a thorough survey on plants of the refuge. We will obtain aerial photography to develop a cover type map and ground truth the information in the field. The cover type map will show locations and acres for each habitat type. In addition, we will record locations of other priority species, and invasive species using a global

positioning system, and identified on the cover type map. We will update the map every ten years. This work will be done with assistance from partners and local naturalists.

Strategy 5: Within 5 years, conduct a comprehensive survey of invertebrates in the spring and summer, noting Federal and State endangered and threatened species. We will use "sticky" sticks (paint stirrers dipped in Tanglefoot Insect Trap Coating and placed horizontally on and vertically in the substrate) to sample ground-based invertebrates throughout the refuge. We will utilize collecting nets to sample winged invertebrates.

Strategy 6: Within 5 years, survey amphibians and reptiles using a combination of pitfall traps, fyke nets, and audio cues. We will survey aquatic turtles using fyke nets during the summer and fall. We will sample terrestrial turtles, snakes, and amphibians using pitfall traps.

Strategy 7: Within 5 years, census migrating raptors, and neotropical migrants for two seasons. We will conduct raptor surveys throughout the fall, using methods developed by the Hawk Migration Association of North America. We will work with local birders and organizations to determine the best method for censussing neotropical migrants.

Strategy 8: Within 10 years, sample freshwater fish throughout the river and ponds on the refuge using passive and active capture gear and electrofishing. Passive gear includes, but is not limited to, gill nets, trammel nets, and fyke nets. Active gear includes, but is not limited to, seines, nets, and hooks. Depending on the diversity and abundance of fish that are found in the ponds, we may initiate mark/recapture studies.

Strategy 9: Within 10 years, survey small mammals using small live box traps, snap traps, and pitfall traps. We will arrange traps in a grid throughout the refuge and trapping will be done during the spring, summer, or fall. If any threatened or endangered species are found, we may initiate mark/recapture studies to develop a population estimate.

Objective 2: Manage aquatic and upland habitat to maintain habitat and species diversity.

We will determine resources of concern, including focus species or species-groups and their habitat needs. Focus species and habitats are most likely to be selected based on a combination of factors such as: endangerment (Federal and State-listed species); priority, national and regional Service plans (such as the NAWMP, the PIF, etc); developing Service policies/regulations such as those related to HMPs and maintenance of ecological integrity; the purpose for which the refuge was established (its value for the conservation of migratory bird species); current/historical species and habitat presence; and recommendations from MassWildlife or

other partners. We will more actively involve adjacent conservation land owners in the preparation and review of conservation plans and management strategies.

Strategy 1: Continue with the status quo of our old field, grassland, upland and wetland habitat management, until our management plans are completed. Some areas that are currently being mowed may eventually be allowed to revert to forest or may be managed as early successional habitat. Until final decisions are made about each parcel, based on the HMP, current management techniques will be allowed to continue.

Strategy 2: Within 2 years, develop a long-range HMP. We will include information for all habitats and species on the refuge, with a focus on resources of regional and national concern (based on regional and Service plans). We will provide quantitative and measurable objectives and strategies for habitat management to enhance resources of concern.

Strategy 3: Within 5 years, complete a Habitat and Wildlife Inventory and Monitoring Plan (HWIMP). We will include an on-going monitoring component designed to measure progress toward those objectives outlined in the HMP, and to allow mid-course corrections or alterations as they may be needed. We will develop any additional step-down plans that may be required, depending on specific habitat management techniques or practices that may be recommended in the plans including chemical, mechanical or fire. We will develop protocols in this plan to be statistically sound and peer reviewed.

Great Blue Heron: Photo by David Margaretos

Strategy 4: Continue to actively manage water levels in the Concord impoundments to mimic the hydrology of a natural wetland. We will continue to record weekly water gauge readings from existing measurement structures in the pools. To effectively utilize the impoundments to mimic the hydrology of a natural wetland, we employ a complex regime. During the spring months, both impoundments are generally full and a variety of species use the impoundments as a nesting area. Marshbirds such as Virginia Rails and Soras nest in the cattails or the impoundments. Waterfowl such as Wood Ducks and Hooded Mergansers nest in the artificial nest boxes or tree cavities.

As the summer months approach and nesting activity has begun to wane in the impoundments, the Refuge staff draw down one of the impoundments. Sometimes water levels are also lowered in the second impoundment later in the summer. Drawdown of an impoundment during the summer benefits a number of species. While an impoundment is being drained, mudflats are gradually exposed. These mudflats interspersed with small puddles of water provide

important feeding and resting habitat for wading birds and migratory shorebirds. As water is drained out of the impoundments, the temperature of the remaining water increases and stimulates invertebrate reproduction, which is a valuable food source for shorebirds and wading birds. The Concord impoundments are an important inland stopover site for migratory shorebirds that are returning from the breeding grounds. Without lowered water levels in at least one of the impoundments, the water levels would be too deep for most shorebirds. During shorebird migration, in a drained impoundment, species present may include Least Sandpipers, Semipalmated Sandpipers, Pectoral Sandpipers, Greater and Lesser Yellowlegs, and Short-billed Dowitchers. In addition, wading birds, such as Great Blue Heron, Green Heron, and Snowy Egrets utilize some of the larger puddles while an impoundment is being drained. As water flows out of the impoundment, smaller fish become concentrated in large disjunct puddles. This provides an ideal feeding situation for wading bird species. When the impoundment is drained, there is sufficient water left in the drainage ditches, and often dozens of wading birds line up along their edges.

Concord Impoundments: USFWS photo

During the fall, staff members gradually fill both of the impoundments to capacity. As the water enters the impoundment it creates pockets of flooded areas which gradually knock the seeds off the plants onto the surface of the water where it is readily accessible to migrating waterfowl. The vegetation that germinates in the impoundment provides an excellent food source and also provides excellent cover. Refuge staff conducts weekly counts at the impoundments to ensure the management strategies are effective.

While management of the Concord impoundments is largely based on migratory birds, there are a number of other factors that the refuge staff must consider when planning the drawdown schedule. In years of heavy rains and high water, it is physically impossible to drain the impoundments until the river level subsides. In years of high water, the impoundments may stay flooded well into July.

Strategy 5: Participate in an alewife stocking program begun in 2000, when funds are available. The goal of the project is to restore historical runs of fish in the herring family to the Concord River. The Central New England Fishery Resources Office in Nashua, New Hampshire applied for a three-year permit to transfer a total of 7,500 alewife to the Concord River from the Nemasket River. Each year 1,000 fish are stocked into four separate locations on the Main stem of the river, and the remaining 1,000 fish are stocked in the Assabet and Sudbury rivers. We will continue to help locate release sites, release stocked fish, and monitor local rivers for fish passage as time and funds allow.

Strategy 6: Continue to actively maintain and restore early successional grasslands and shrublands on approximately 100 acres of the refuge through hydro-axing and mowing, for birds that depend on this habitat. We will continue to mow approximately 30-50 acres of fields each year in mid- to late-August on a three to five year rotating schedule in order to maintain grasses without disturbing ground-nesting birds. Refuge fields exist in Carlisle, Sudbury, and Wayland.

Strategy 7: Continue to seek opportunities to develop cooperative management agreements with neighboring conservation organizations and individuals. We will work with our conservation partners and, where our mission, goals, and objectives are compatible, will work together to implement habitat management and biodiversity strategies.

Objective 3: Limit the spread of non-native invasive and overabundant species and minimize habitat degradation.

Strategy 1: Document presence, acreage, and location of invasive and overabundant species in conjunction with vegetation surveys and development of a cover type map. We will map the existence of non-native invasive and overabundant species.

Strategy 2: Develop an Integrated Pest Management Plan (IPMP), which would provide the fullest possible range of alternative control strategies. We will include a monitoring program as a part of the plan, which will consist of plot sampling, estimates of cover, and responses of wildlife and other plants. We will use the IPMP in concert with habitat monitoring to assess progress and the effectiveness of different control and eradication techniques, and identify additional problem species. We will research alternative methods of controlling certain species as appropriate, based on monitoring results. Control strategies will be species specific and may employ biological vectors, mechanical methods (hand pulling), fire, or herbicides. We will use the least intrusive, but most effective control practice. As previously discussed, use of herbicides would require action specific step down plans, and in some situations proposed control methodologies may also require wetland permitting review and approval.

Strategy 3: Continue to control water chestnut, purple loosestrife, common reed, cattail, and other specific species. We use biological control to combat purple loosestrife via the release of beetles and weevils. Depending on staffing levels and effectiveness, we will continue to raise beetles in a rearing facility and release up to 10,000 *Galerucella pusilla* and *G. calmariensis* beetles annually in Sudbury, Concord, and Carlisle in an effort to cut costs. In addition, we will occasionally release weevils (Hylobius transversovittatus) when available. We will quantitatively document the effects of beetles and weevils on loosestrife on the refuge. We will also continue to use herbicides on loosestrife.

We will control water chestnut in the Concord impoundments, using the 2002 Water Management Plan as a guide. We drain the impoundments in the summer months to control seed viability (survival). We maintain ditches in the pools as needed, using an amphibious excavator, to ensure proper drainage of the pools. In addition, we occasionally use an aquatic weed harvester to remove whole plants from the impoundments. The weed harvester is also used by local and State partners in rivers and pools where water levels can not be managed.

Purple loosestrife: Photo by Karla Thompson

We will manage large, monotypic stands of cattails through mowing, flooding and herbicides where appropriate.

We have identified a small one-to-five acre patch of common reed on the Concord River in Carlisle that we will control by chemicals, mechanical removal, mowing, and flooding. Chemical application will probably be the most effective and efficient technique. Glyphosphate is the most widely used chemical and would be applied in late summer or early fall, directly to the plant, when they are in full fluorescence. Stands would probably need to be treated for two to three consecutive years for effective control.

Where autumn olive, Asiatic bittersweet, yellow iris (*Iris pseudacorus*), and Japanese honeysuckle (*Lonicera japonica*) are found on the refuge, we will use hand pulling where feasible. Larger plants of autumn olive and Asiatic bittersweet will be cut and herbicide will be painted on the stumps to prevent re-sprouting. Because autumn olive, Asiatic bittersweet, and yellow iris all re-sprout and grow quickly after being cut, burning could actually worsen the problems caused by these species. We will not use fire as a control mechanism.

Other invasive species that will be managed include Japanese knotweed, common buckthorn (*Rhamnus cathartica*) and glossy buckthorn (*Frangula alnus*). As new invasive species are identified, we will work to monitor and reduce and/or eliminate them from the refuge. We will establish annual treatment goals and will work in partnership with neighboring landowners, towns and agencies to monitor and control invasive species.

We will also participate in appropriate, experimental invasive species control research programs, if such programs have been reviewed and approved by Service regional or national biological staff and the Department of the Interior's wildlife research arm, the Biological Resources Division, now located within the U.S. Geologic Survey (USGS).

Strategy 4: Control invasive and overabundant animal species using the most effective means available. There are no currently identified problems related to overabundant or invasive animal species on the refuge. However, beaver have occasionally caused localized flooding of on refuge trails and maintenance roads on other Complex refuges. We will continue to install and maintain beaver control devices on refuge wetlands and beaver meadows. In recent years, beavers have caused flooding of refuge trails and maintenance roads. Control of such situations includes manually clearing culverts, installing grates on culverts and water-control structures, and installing beaver deceivers in dams or on culverts. Devices range from a simple PVC pipe inserted into dams to reduce water levels, to fencing constructed in a semicircle around a culvert with drain pipes inserted through the fence. If more serious threats to habitat, refuge facilities, adjacent property or endangerment of health arise, we will work, in coordination with the DFG, to either trap and relocate individual animals from problem sites, permit licensed sports trappers or hunters to reduce population numbers, remove individual beavers through trapping or shooting by refuge staff, or permit a licensed animal damage control firm to reduce population numbers by trapping. If needed, we will issue a special use permit and complete a compatibility determination outlining specific requirements and conditions for beaver removal.

Beaver activity: Photo by David Margaretos

We will monitor mute swans on the refuge. In an effort to keep this aggressive, non-native species from becoming a resident on the refuge, territorial or nesting swans on the refuge will be lethally removed after obtaining appropriate permitting from our migratory bird office.

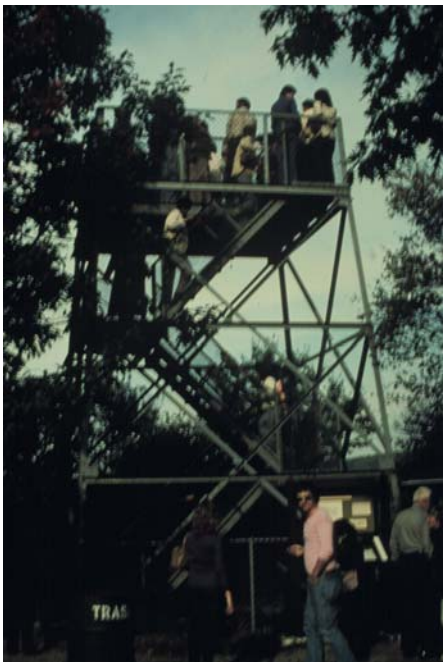
We will monitor and treat hemlocks for infestation by wooly adelgid. One current known area of infestation is on Weir Hill, behind the refuge headquarters. It is possible that infestations will occur on other parts of the refuge as well in the future.

Goal 3: Build a public that understands, appreciates, and supports refuge goals for wildlife.

Objective 1: Increase the visibility of the refuge in the community and raise visitor's awareness of the Refuge System in general and the refuge in particular.

Strategy 1: Within 3 years, develop a Visitor Services Plan that describes all the planned public uses using standard regional guidelines. The plan will involve setting public use goals, determining measurable objectives, identifying strategies, and establishing criteria for all visitor services. The plan will also outline future funding and staffing needs. Several step-down

plans will be required prior to opening or expanding public use plans including a fishing plan and hunting plan (Maps 4-1 through 4-4 indicate public uses at Great Meadows NWR).



Observation Tower at the Concord Impoundments: USFWS Photo

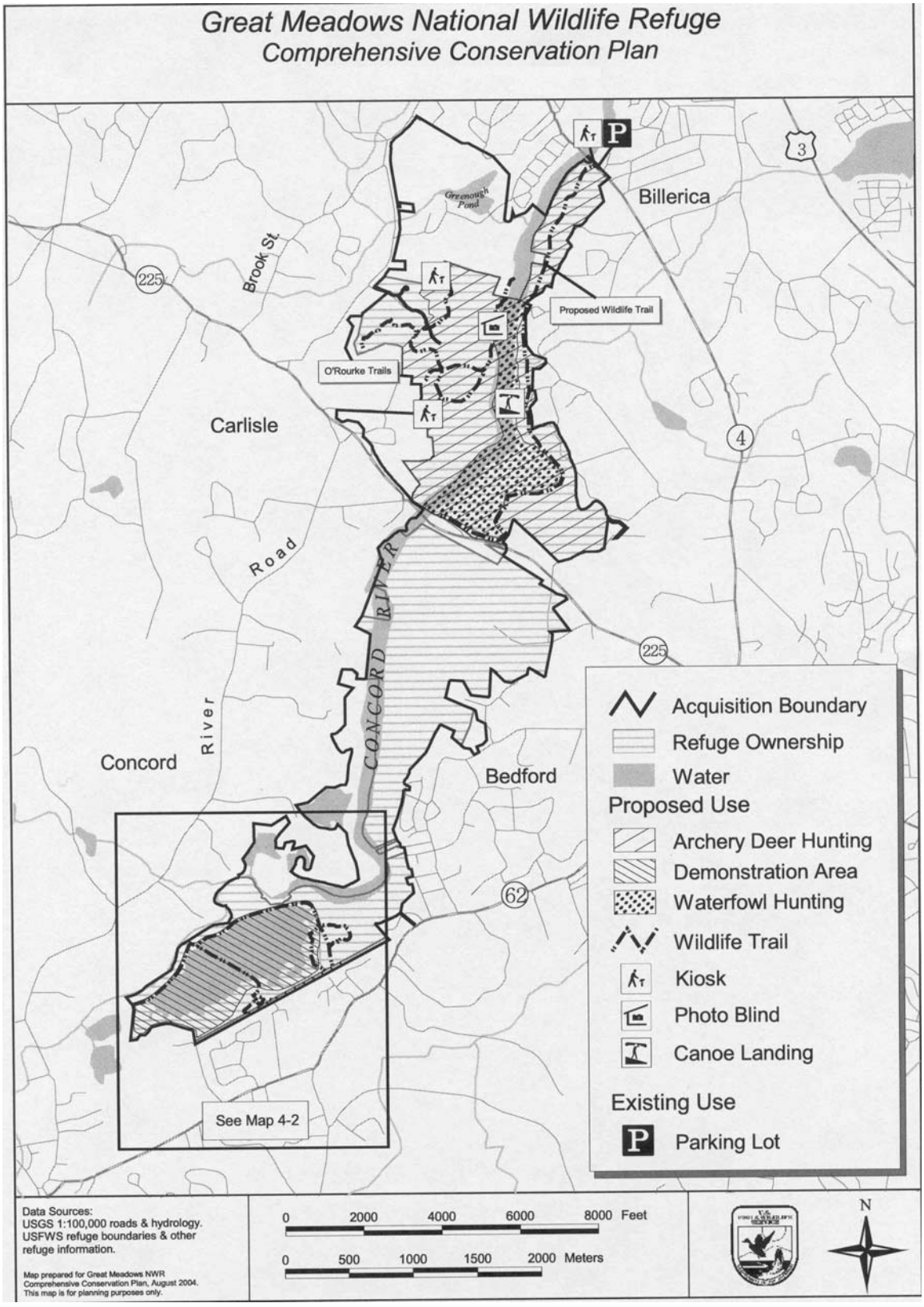
Strategy 2: Work with individual towns to improve directional signage to all public use areas on the refuge.

Strategy 3: Within 10 years, create and open several wildlife management demonstration sites throughout the refuge. We will further develop potential sites in the Visitor Services Plan. We will design these areas to demonstrate various wildlife management activities, their success and failures, and explain what things people can do at home to help wildlife. We will strive for the refuge to be seen by the public as a premier destination to learn about wildlife management. We will develop environmental education and interpretive programs, signs, and brochures to explain these demonstration sites to visitors. We will develop one demonstration area/site at the Concord impoundments.

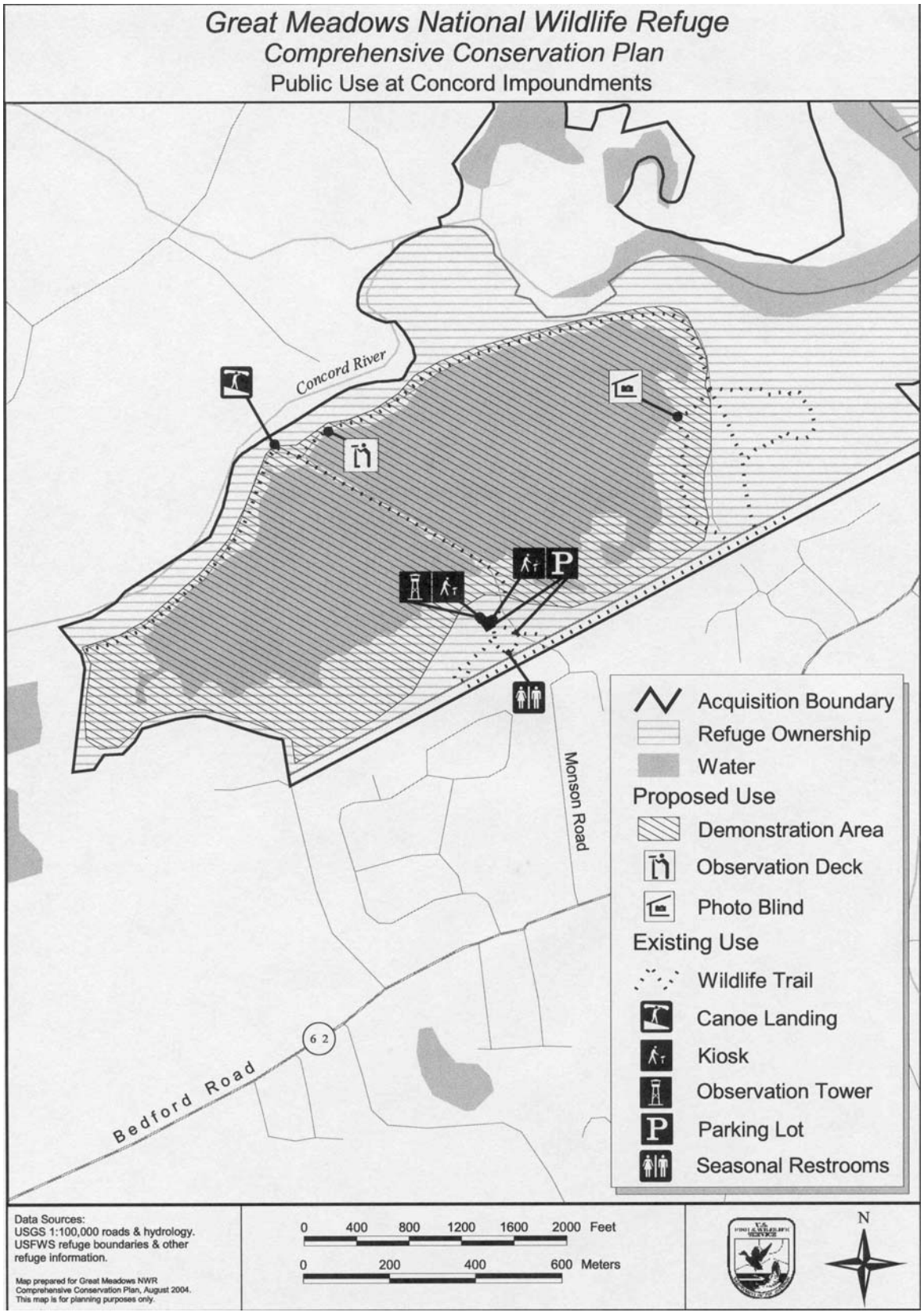
Strategy 4: Within 7 years, replace the existing observation tower with a universally accessible observation platform. The new structure will be built within the footprint of the existing observation area, and will provide all visitors with equal opportunity to view the Concord impoundments and understand refuge management techniques and practices. We will design the lower level of this structure to provide visitors hands-on experience into how these pools are managed. Visitors would also be exposed to various exotic species management options.

Strategy 5: Develop and initiate a monitoring program to evaluate intensity and potential impact of each public use. We will participate in research projects that look at impacts of uses on wildlife areas and means of determining carrying capacity of an area. We may modify public use activities in the future, if adverse impacts on wildlife or habitat are identified.

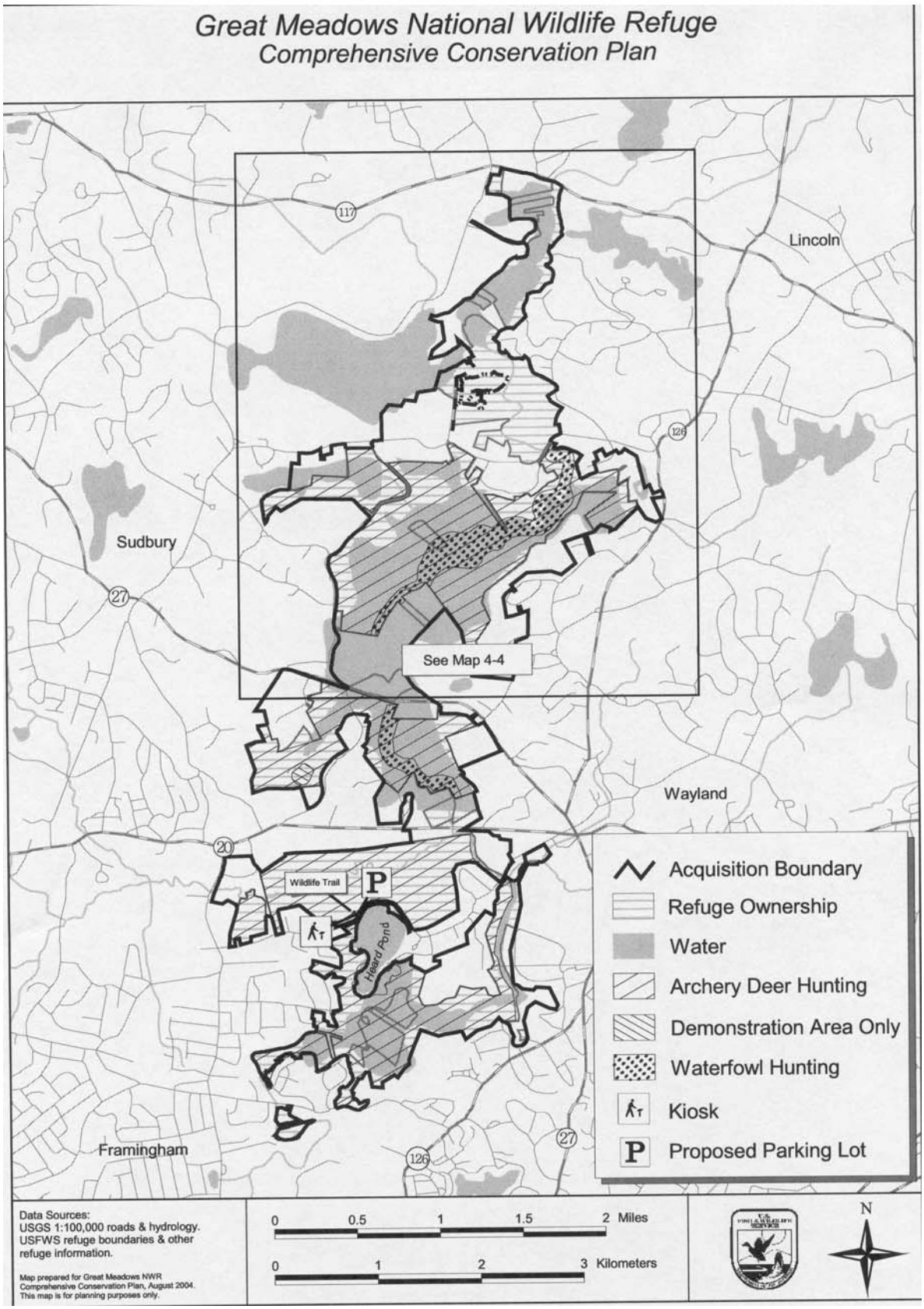
Map 4-1: Public Use at Concord Division



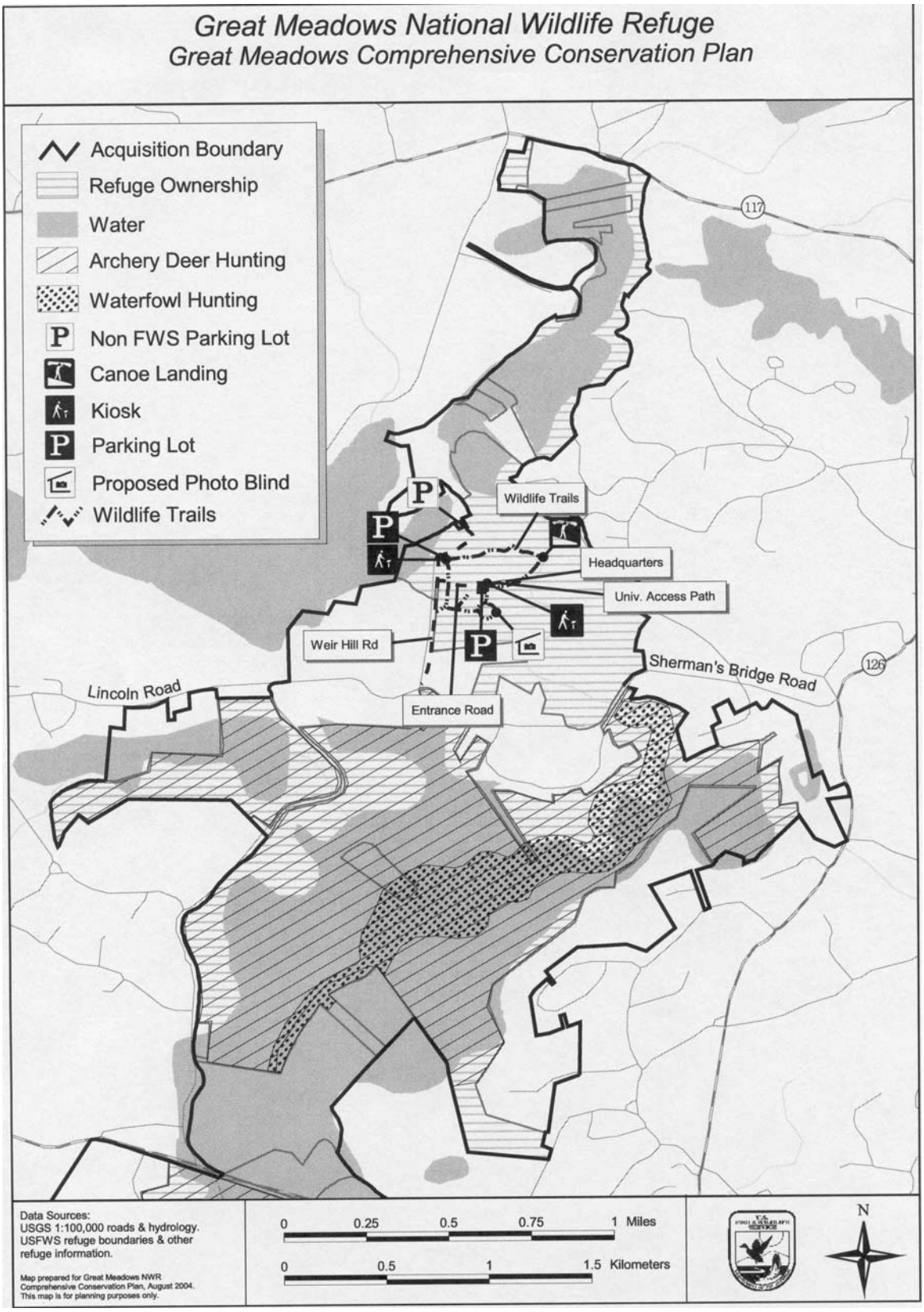
Map 4-2: Public Use at Concord Impoundments



Map 4-3: Public Use at Sudbury Division



Map 4-4: Public Use at Sudbury Division



Strategy 6: Develop interpretive materials to be placed in the Boston Metro area. Materials to be developed may include a kiosk to be placed at Logan Airport or the new National Park Service Headquarters, an exhibit in the Boston Law Enforcement Office, posters for the "MBTA" and commuter train, or Service announcements on the radio. We will work with partners from within and outside of the Service to develop such materials and will discuss the options in full in the Visitor Services Plan.

Strategy 7: Continue to staff the Refuge Visitor Contact Station and Headquarters Monday through Friday 8:00 a.m. - 4:00 p.m. The Visitor Contact Station is occasionally open on weekends from May to October. The conference room/auditorium is open to conservation and/or educational organizations to conduct meetings and workshops. We also conduct roving interpretation on the trails during the summer months, providing staff or volunteers are available. We will continue to provide simple exhibits on the Service and local issues at the Visitor Contact Station.

Strategy 8: Develop a relationship with a Friends organization or a cooperating association to run a small bookstore at the Visitor Contact Station. There is currently a small bookstore in the Visitor Contact Station which had, in the past, been run by the SuAsCo Great Meadows Education Fund. This organization is now defunct, and the bookstore has not been restocked. Items sold through the store focus on increasing visitors understanding and appreciation of the natural world and the refuge. Profits from the store are used to support the refuge's public use program.

Strategy 9: Continue to be active participants in local community and conservation organizations. We will also initiate programs to provide local communities and landowners with educational and informational material and strategies related to natural resource protection and restoration.

Strategy 10: Provide opportunities for volunteers to contribute to the success of the refuge. As Great Meadows NWR continues to contribute to the quality of life in east-central Massachusetts, strong support in the community and the region will also continue to contribute to its success. Helping hands are needed for program development, data gathering, and other opportunities discussed in these alternatives. Only with this type of assistance can the refuge fully achieve its goals and objectives, support the missions of the Refuge System and the Service, and help meet the needs of the community. We continue to view volunteers as an essential part of our manpower and ability to meet its mandate. Examples of projects volunteers assist with include: leading school, Scout, and interpretive programs, performing surveys, greeting visitors, staffing special events and the Visitor Contact Station, posting boundaries, and maintaining trails. We have over 100 volunteers. Some help once a year while others help once a week or more often.

Volunteers participate in a wide variety of activities. These include wildlife and wildlands photography, assisting with or conducting educational and interpretive programs, providing information to visitors, conducting observations and surveys of wildlife species, botanical surveys, fabrication of wood duck and bluebird boxes, litter pick-up, trail clearing and maintenance, sign rehabilitation, and other maintenance projects.

The volunteer program at the Complex has been growing steadily. In 1990, volunteers provided more than 3,435 hours of assistance to the Complex. In 2000, volunteers provided 20,675 hours of service. The total for 2003 was 2,532 hours specifically at Great Meadows. Much of this volunteer work was done by core volunteers and active Friends Group members. In 2003 and 2004, we again received incredible support from volunteers. We are deeply indebted to all of our volunteers for their dedication and services rendered for the betterment of our nation's natural resources.

Strategy 11: Construct a Visitor Center for the Complex which is administered by staff from the Great Meadows NWR. See Chapter 5 for additional information about the proposed center.

Objective 2: *Provide opportunities for wildlife observation and photography where such opportunities can be safely provided while achieving refuge purposes.*

Strategy 1: Provide and maintain public use trails. Refuge visitors can access trails on both the Concord and Sudbury Divisions. Trails listed below currently exist on the refuge.

Sudbury Division trails
Weir Hill Trail (Sudbury) - 1.1 miles
Griscom Trail at Heard Pond (Wayland) - 0.25 mile

Concord Division trails
Dike Trail (1.7 miles), Timber Trail (0.4 mile), Edge Trail (0.6 mile) and Black Duck Creek Trail (0.15 mile), located at the Concord impoundments (Concord) - 2.7 miles
River Trail and Red Tail Trail located on O'Rourke Farm (Carlisle) - 3 miles
Route 4 Bridge (Billerica) - new trail partially developed

In addition, we will work with the Town of Bedford to develop a trail from the boat launch on Rt 225 up through Billerica, including access to Two Brothers Rocks.

A process will be developed as part of our Visitor Services Plan to evaluate opportunities for new trails, including partnerships with towns, conservation organizations, and private landowners.

Strategy 2: Continue to provide opportunities for canoeing and kayaking on the Concord and Sudbury rivers to enhance opportunities for wildlife observation, photography, fishing, and hunting. We will continue to maintain 2 formal canoe landings on the refuge, one at Weir Hill and one at the Concord impoundments. The State and towns maintain several other launches and landings as well (see Maps 4-1 through 4-4). We will establish a canoe landing, with appropriate signage, at the historic Two Brothers Rocks. We will identify additional opportunities in our Visitor Services Plan to establish or formalize existing river access points along the Sudbury and Concord Rivers.

Paddling on the Sudbury River: Photo by Karla Thompson

Strategy 3: Sponsor an annual photo contest. From 1998 - 2002, we hosted a very popular photography contest. Entries fell into three categories: wildlife, recreation, and landscape. We will reinitiate the photography contest beginning in 2005. Photos must be taken on one of the refuges in Massachusetts. Local sponsors supply prizes for winning entries. An unveiling of winning photos and slides takes place during National Wildlife Refuge Week each October. Winning entries are displayed in the Complex Visitor Contact Station for several months. We use entries for refuge purposes in educational and promotional programming.

Strategy 4: Within 3 years, reestablish a parking area at Heard Pond (Map 4-3). The parking area will hold up to six cars, and will make access to the area safer for visitors. A kiosk will be constructed at the parking area, signage will be improved, and the parking area will be regularly monitored by refuge staff.

Strategy 5: Within 7 years, build at least three wildlife observation and photo blinds on the refuge. We will establish one blind at the Concord impoundments, and one at the Sudbury Division. We will construct these blinds to be universally accessible, which will provide access and viewing opportunities to all visitors. (Map 4-2 and 4-4).

Objective 3: *Provide and enhance opportunities for environmental education, interpretation, and outreach where appropriate and compatible with refuge purposes.*

Strategy 1: Continue to provide assistance to all scheduled school groups who use the refuge. Currently, we provide a welcome talk and introduction to the Refuge System to over 100 classes annually. We lead programs for some groups focusing on habitat types, pond study, and refuge management. When requested we will continue to assist teachers at their schools, as time and funds allow. The Concord Division will continue to be

the heaviest used Outdoor Classroom site on the refuge by schools. The Weir Hill Outdoor Classroom is used to a lesser degree by schools.

Strategy 2: Continue to sponsor several teacher workshops annually. One-day workshops include Project Wild activities and activities teachers can use at the refuge during a visit. The workshops also discuss planning a field trip to the refuge.

Strategy 3: Continue to sponsor the Urban Education Program. We started the program in 1999 with a focus on working with inner city, multi-cultural students in the Worcester and Boston area. Students in the program visit one of the Complex refuges three times and staff members from the refuge visit their classroom three times in each of the 4th, 8th and 12th grades. This long-term relationship with the Service fosters an understanding and appreciation for the refuge and creates an avenue for career opportunities with the Service. Within the next 10 years, we will expand the program to include no more than six schools in Boston and six schools in Worcester. We will look at expanding the program to the Lowell and Lawrence area as well. We will publish papers and curriculum from this program, which is viewed as a pilot program for urban refuges across the country. Our goal is to encourage students from the program to enter college to study natural resources and/or wildlife management, and then to participate in the Service Student Career Education Program, a program that offers college students the opportunity to gain professional experience with the Service during school with possible job placement after graduation.

Environmental Education: Staff photo

Strategy 4: Continue to offer on- and off-site interpretive programs to visitors at all public use areas. As time and funds allow, we will provide off-site interpretive programs when requested. Programs focus on refuge management, mission of the Service and species that can be found on the refuges. All programs are free and open to the public. Programs to scouts are offered as requested. Eagle Scouts help to maintain trails and build boardwalks.

Strategy 5: Maintain existing informational and educational kiosks and provide additional facilities as needed. Existing kiosks are located at the Concord impoundments, Weir Hill, and Heard Pond. We will install four additional kiosks at areas with high public use; specific locations will be determined in the Visitor Services Plan.

Strategy 6: Provide interpretive signs and self-guided trails with fact sheets at the Concord impoundments and Weir Hill trails. We will maintain interpretive signs about refuge management and species' natural history along the Weir Hill and Concord Dike trails. We will continue to produce general Complex brochures, refuge-specific brochures, and a bird guide for

the refuge. We also provide two self-guided trail brochures: one is found at the Sudbury Division - Weir Hill, the other at the Concord Division- Dike Trail. Visitors can obtain these brochures at the Visitor Contact Station or at trail-heads. We will also work with conservation partners to develop a brochure for a self guided canoe trail on the Concord and Sudbury Rivers.

Strategy 7: Continue to host between two and four special event days annually. Each event is a minimum of four hours and revolves around a single theme. Special celebrations may include Bluebird Day, National Hunting and Fishing Day, and Wildlife Art Festival.

Strategy 8: Continue to permit guided tours by outside groups through annually renewed Special Use Permits. Each group is required to give basic refuge information to the participating public. We receive information on each program offered on the refuge including type of program, number of participants, and number of programs offered.

Strategy 9: Improve communication with the public through the development of an electronic newsletter to local citizens, an improved website, and improved media relations. This newsletter will replace the previous Meadows Messenger which began in the early 1980's. Articles in the newsletter and website will inform the public of ongoing management and upcoming activities. We will develop news releases to more then 20 local papers and radio stations about upcoming events and ongoing management activities.

Strategy 10: Provide assistance to all scheduled school groups to the refuge. Within 7 years, we will develop a refuge curriculum for grades K-12 that incorporates Massachusetts Curriculum Frameworks and refuge messages. All groups who use the refuge will participate in one of the programs developed. The exhibits, wildlife demonstration sites, and refuge management objectives are tied into the curriculum. We will show teachers how to use and teach the curriculum through an accredited teacher workshop. We will assist teachers at their schools, as requested. We will also work with other conservation organizations and education programs to coordinate efforts and messages provided in environmental education programs in the area. We will develop a welcome/orientation video for schools and visitors to better understand the mission and opportunities the refuge has to offer visitors.

Environmental education opportunities: USFWS Photo

Strategy 11: Enhance and expand the Outdoor Classroom sites. We will spread the school groups more evenly between the Concord Division and Weir Hill Outdoor Classroom sites. We will develop a third Outdoor Classroom site either at the O'Rourke Farm in Carlisle, Heard Pond in Wayland, the Strand property in Sudbury, or at a new Complex Visitor Center site. We will work with other conservation organizations and

education programs to coordinate efforts and messages provided in environmental education programs in the area.

Objective 4: Provide opportunities for hunting and fishing where appropriate and compatible with refuge purposes.

Parts of the Great Meadows NWR will be open for archery deer hunting and waterfowl hunting. Specific areas are identified below and are depicted on Maps 4-1, 4-3 and 4-4. The refuge is currently open for fishing.

Before hunting is allowed on the refuge, the Code of Federal Regulations must be amended to authorize the hunting of migratory game birds and big game (white tailed deer) hunting on Great Meadows NWR. There will be a public comment period announced in the Federal Register. We anticipate an early 2005 Federal Register notice. Refuge staff will prepare a Hunt Plan before hunting is allowed on the refuge. No additional NEPA compliance is necessary.

Providing hunting and fishing opportunities addresses the mandates of Executive Order 12996 and the Refuge Improvement Act by providing the public with an opportunity to engage in wildlife-dependent recreation. Hunting and fishing are recognized by the Service as traditional forms of wildlife related outdoor recreation. We anticipate a low to moderate degree of hunting pressure to occur as a result of opening the refuge for this activities. The plan to permit hunting on the refuge will not affect wildlife populations in Massachusetts, as the refuge represents only a very small portion of the overall habitat available in the State.

The refuge weighs a number of factors in opening an area to hunting, including visitor safety considerations. The Refuge Manager may, upon annual review of the hunting program, impose further restrictions on hunting activity, recommend that the refuge be closed to hunting, or further liberalize hunting regulations within the limits of State law. Restrictions would occur if hunting becomes inconsistent with other higher priority refuge programs or endangers refuge resources or public safety.

Annual permits will be required for hunting on the refuge. The permits will facilitate managing numbers of hunters and harvest. Fees charged for these permits will offset but not completely cover costs associated with managing hunting programs. For additional information on the fee program, see the section on fees beginning on page 66.

Enforcement of federal and state hunting and fishing regulations will be accomplished through patrols by refuge law enforcement officers. Enforcement patrols may also be conducted by State Environmental Police Officers. The frequency of patrols will be determined by hunter use, the level of compliance observed during patrols, and information obtained from participants, visitors and other sources. Refuge brochures and hunter

orientation prior to the hunting seasons will emphasize refuge specific regulations, safety considerations and the protection of wildlife species found on the refuge.

In addition to State hunting regulations, the refuge may impose additional regulations. Examples of refuge regulations that would apply to hunting on the refuge include:

- hunters will be required to obtain permits from the refuge to hunt on the refuge;
- hunters may enter the refuge two hours before legal sunrise and must leave within 1.5 hours after legal sunset, and hunting can occur no earlier than one-half hour before sunrise and one-half hour after sunset;
- no night hunting will be allowed on the refuge;
- pre-hunt scouting of the refuge is allowed by permit, during specific time periods;
- carrying guns is not permissible during pre-hunt scouts;
- permanent blinds are not permitted on the refuge;
- all hunting materials, tree stands, and flagging must be removed at the end of each hunting day;
- no one shall insert a nail, screw, spike, wire, or other ceramic, metal, or other tree-damaging object into a tree, or may hunt from a tree into which such an object has been inserted;
- the unauthorized distribution of bait and the hunting over bait is prohibited on wildlife refuge areas;
- all firearms must be unloaded outside of legal State hunting hours;
- the use of all terrain vehicles (ATV's) and snowmobiles on refuge land is prohibited;
- training of dogs on the refuge is not permitted;
- open fires are not permitted;
- the use or possession of alcoholic beverages while hunting is prohibited

Check stations will not be established on the refuge at this time but reporting requirements will be instituted. Refuge staff will provide information about reporting forms when permits are issued.

The refuge will work with partners to provide increased hunter education through training, brochures, and news releases.

As a part of the hunt plan we will determine exactly when hunting will be allowed. The maximum amount of time that the refuge will be open for hunting is the full state seasons for each type of hunting. It is possible that we will open for a shorter duration, limited hours, or limited days of the week. In Massachusetts there is no hunting on Sundays. To illustrate the maximum potential hunting period, Table 4-1 displays the 2004 Massachusetts hunting seasons for each of the types of hunting proposed for Great Meadows NWR.

Table 4-1: 2004 Massachusetts Hunting Seasons

Season	Start Date 1	End Date 1	Start Date 2	End Date 2	Start Date 3	End Date 3
Deer	10/11/2004	11/20/2004	11/29/2004	12/11/2004	12/13/2004	12/31/2004
Ducks and Regular Canada Goose	10/13/2004	11/27/2004	12/17/2004	1/8/2005		
Early Canada Goose	9/7/2004	9/25/2004				
Late Canada Goose	1/15/2004	2/15/2004				

Strategy 1: Within 2 years, open approximately 2,280 acres of the refuge to archery deer hunting during the State archery, muzzleloader and shotgun seasons (the refuge will not be opened to firearm deer hunting, but archery hunters are allowed to hunt with bows during these seasons). Areas to be opened include portions of refuge lands north of the Route 225 Bridge in Bedford, most of the O'Rourke tract in Carlisle, and portions of lands south of Sherman Bridge (Maps 4-1 and 4-3). We will provide hunting opportunities on the refuge in accordance with Massachusetts State regulations and requirements. Among other restrictions, these regulations prohibit the discharge of any firearm or arrow upon or across any State or hard-surfaced highway or within 150 feet of any such highway, and hunting within 500 feet of any dwelling or building in use, except as authorized by the owner of occupant thereof. A permit and fee will be required.

Any necessary, refuge-specific regulations or restrictions would be disseminated through refuge hunting brochures, news releases, refuge website, and on-site informational signing.

Strategy 2: Within 2 years, open approximately 334 acres of the refuge to waterfowl hunting in accordance with Federal and State regulations and restrictions. The following areas would be open to waterfowl (ducks and geese) hunting: Refuge ownership on the Sudbury River and adjacent wetlands from Sherman's Bridge Road south to Route 20 and an area adjacent to the south side of Heard Pond including the Sudbury River and approximately 74 acres of refuge land, and the Concord River and associated wetlands from Route 225 Bridge to the northern end of the O'Rourke property (see Maps 4-1 and 4-3).

Concord River: Photo by Sherry Fendel

With respect to waterfowl, these species are already regulated at the State and Federal level. Duck and goose populations are managed at the national flyway level. The Service annually announces a regulatory framework within which States can set their hunting seasons, including bag limits and hunting dates.

The refuge will not be open for the hunting of the American woodcock, a migratory game bird.

Strategy 3: Continue to allow fishing on the Concord and Sudbury rivers. We provide boat and canoe fishing opportunities, in compliance with State regulations and restrictions, on the 12 miles of the Sudbury and Concord Rivers that flow through the refuge. Fishing within refuge ponds, pools and wetlands is prohibited to prevent disturbance to wildlife and habitat. Fishing from the banks of the Concord and Sudbury Rivers within the refuge is closed to prevent disturbance to migratory birds, destruction of habitat, including the marshes along the shoreline, bank erosion, litter, and due to limited accessibility.

Monarch butterfly: Photo by Veronique Schejtman

Strategy 4: Provide fishing access via a wheelchair-accessible fishing pier on Heard Pond. Heard Pond is a state-managed "Great Pond" which is open for fishing at designated areas along the banks. The refuge will seek funding to install a seasonal fishing pier accessible from refuge lands off of Pelham Island Road. The pier will be removed each fall and installed each spring to encourage safe and accessible fishing.

Objective 5: Provide opportunities for non-wildlife dependent activities when they assist visitors in participating in wildlife dependent activities and when such use does not detract from the refuge purpose.

Strategy 1: Continue to allow, but not encourage jogging. Staff and volunteers have observed disturbance to wildlife caused by joggers. We plan to analyze the potential impacts of jogging within the next three years on Service trust resources and priority public uses and will consider modifying or eliminating the use in the future, based on this additional analysis.

Strategy 2: Within a year, eliminate dog walking from the refuge. This use has been found to disturb wildlife and other visitors and is not considered one of the six priority uses on national wildlife refuges.

Strategy 3: Remain closed to other non-wildlife dependent activities such as bikes on trails, horseback riding, dog sledding, snowmobiling and swimming. No picnicking facilities will be provided and permits will not be issued for events, such as family reunions, where meals are a major component. Visitors will be allowed to snack and drink a beverage while on refuge trails. Bicycles are allowed in parking lots and on entrance roads. Bikes are not permitted on refuge trails.

Goal 4: Adequately protect cultural resources that occur in the complex.

Strategy 1: Continue evaluations or surveys of cultural resources (archeological and historical) on a refuge project-specific basis. Soil disturbance requires resource evaluation and clearance. Federal cultural resource protection laws and regulations would be enforced.

Strategy 2: Within 10 years, initiate and complete cultural and historical resource surveys and inventories on a refuge-wide basis. The archeological survey portion of this work will be designed to develop predictive models that could be applied refuge-wide in evaluating the potential of future projects to impact cultural resources.

Strategy 3: Comply with Section 106 of the National Historic Preservation Act before conducting any ground disturbing activities. Compliance may require any or all of the following: State Historic Preservation Records survey, literature survey, or field survey. The Service has a legal responsibility to consider the effects its actions have on archeological and historic resources.

Goal 5: Maintain a well-trained, diverse staff working productively toward a shared refuge vision.

We will continue to utilize Service policy, training opportunities, and other appropriate means to meet the staffing goals.

General Refuge Management

The following management direction applies to various refuge goals and across program areas. Some of this direction is required by Service policy or legal mandates. Management direction is organized by topic area.

Refuge Access and Fees

The Complex will charge an entrance fee at the Oxbow and Assabet River NWRs, and at the Concord impoundments of Great Meadows NWR, and a user fee for hunting on the Complex. Our fee program will be established under the Recreation Fee Demonstration Program (Fee Demo Program), a program which Congress initiated in 1997 to encourage Department of Interior agencies that provide recreational opportunities to recover costs for their public use facilities, improve visitor facilities, promote activities for visitors and address the maintenance backlog of visitor service projects (USFWS 1997a). Congress re-authorized the Fee Demo Program in 2004 for 10 years. The Fee Demo Program requires at least 70% of revenue remain at the collection site. Currently, 80% of the funds raised from user fees on a particular refuge in this region stay at the refuge. The other 20% is sent to the region to be distributed to other refuges. No more than 15%

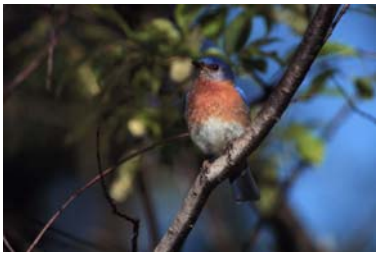
of the fees collected can be used for fee collecting or fee collection systems. The Complex has received money from these regional funds in previous years for public use facilities. If the program does become permanent, the percent of revenue remaining on site could change, however it will never be less than 70% and could be as much as 100%. Visitors with a current duck stamp, Golden Eagle Pass, Golden Age Pass or Golden Access Pass do not have to pay entrance fees.

The following entrance fee program would be initiated at the fee areas of the Complex.

- A one day entrance fee will be charged per car or per group if arriving via foot or bicycle. Our proposed fee would be $4 per day.
- An annual pass for three refuges in the Complex (Assabet River, Great Meadows and Oxbow) would be available for $12.
- Daily entrance fees will be collected by refuge staff stationed on site or at self-service fee collection stations.
- Self-service fee collection stations will likely consist of a secure box with envelopes to register and pay the daily or annual fee.
- We will attempt to make purchase of the annual pass available by fax and on-line. The pass will also be available at the Refuge Headquarters.

The following Hunting Permit Fee Program will be implemented in conjunction with the hunting program described earlier in this chapter.

We will charge an annual fee of $20 for a hunting permit. This permit will be valid for all unrestricted hunting seasons open on the Northern refuges (Assabet River, Great Meadows, and Oxbow NWRs). Hunters with a valid hunt permit will not have to pay an entrance fee while scouting or hunting.



Eastern Bluebird: Photo by Bruce Flaig

There may be a need to limit hunting during certain seasons to ensure a safe, high-quality hunt. Details of these restrictions and any application requirements will be outlined in the Hunting Management Plan. Based upon these restrictions, purchase of a permit does not guarantee the ability to hunt all seasons on all refuges. No additional fee would be required for hunting applications for restricted seasons.

At the time of purchase of the annual hunting permit, the individual may choose to purchase an annual entrance pass for an additional $5. The combined permit/pass must be purchased jointly. Individuals that do not purchase the combination permit/pass would be subject to entrance fees on the refuge during times when they are not hunting or scouting.

We realize that the new fee program will require an adjustment period. Our plan for instituting the fee includes: an educational period, a warning period, and finally a transition to full enforcement.

We may adjust fees over the 15 year period addressed in this plan to reflect changes in administrative costs or management goals.

Accessibility

Each refuge will operate its programs or activities so that when viewed in its entirety, it is accessible and usable by disabled persons. The Rehabilitation Act of 1973, as amended, requires that programs and facilities be, to the highest degree feasible, readily accessible to, and usable by, all persons who have a disability.

Non-Wildlife Dependent Public Uses

We will eliminate dog walking opportunities from the refuge within a year of the publication of this plan. We have found dog walking to disturb wildlife and other visitors and it is not considered one of the six priority uses on national wildlife refuges. We will continue to allow jogging, but it will not be encouraged. We plan to analyze the potential impacts of jogging within the next three years on Service trust resources and priority public uses and will consider modifying or eliminating the use in the future, based on this additional information. The refuge will remain closed to other non-wildlife dependent activities such as bicycling, horseback riding, dog sledding, snowmobiling and swimming. No picnicking facilities will be available. Bicycles are only allowed in parking lots and on public entrance roads.

Fire Management

U. S. Department of the Interior and Service policy state that Refuge System lands with vegetation capable of sustaining fire will develop a Fire Management Plan (FMP) (620 DM 1.4B; 621 FW 1.1.1). The FMP, which includes Great Meadows NWR, provides direction and continuity in establishing operational procedures to guide all fire management objectives as identified in the plan. This plan was finalized in March of 2003. The FMP includes descriptions of the refuges and addresses wildland and prescribed fire events. The FMP also defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a service-wide requirement that refuges with burnable vegetation develop a FMP (620 DM 1).

Great Meadows NWR: Staff photo

The associated EA was prepared in compliance with NEPA and the Council on Environmental Quality (CEQ) Regulations (40 CFR Parts1500 -1508). It provides a description of the purpose and need for the project, a brief background, the features of each alternative, the affected environment, and resulting effects and consequences of each alternative. The selected

alternative, "prescribed fire and wildland fire suppression" is discussed in detail in the EA. Alternatives which were considered, but not selected, include differing combinations of: allowing naturally ignited fires to burn in some instances; use of prescribed burning to achieve wildlife resource and habitat objectives; and, wildland fire suppression. A "no-action" alternative of allowing all fires to burn at all times was initially considered, but dismissed as not suitable for further consideration in the development of this proposal. The no-action alternative was rejected because it fails to meet Service policy in regards to potential liability for losses of life and property, as well as its unacceptable environmental, social, and economic costs.

The mission of the Complex is to protect and provide quality habitat for fish and wildlife resources and for the development, advancement, management, and conservation thereof. By defining an appropriate level of wildland fire protection, and integrating a prescribed fire program based on biological needs, the FMP and EA are fully supportive and sensitive to the purpose of the Complex, and of benefit to the Service, in performing its activities and services.

If you would like a copy of the FMP, or the EA, please contact the Refuge Headquarters in Sudbury.

Land Protection

The Service is currently working on a new national land conservation policy and strategic growth initiative. This policy will develop a vision and process for growth of the Refuge System, helping individual refuges better evaluate lands suitable for inclusion in the Refuge System. The process will help ensure that lands the Service protects are of national and regional importance and meet certain nationwide standards and goals. Also, some of the focus of reevaluating Refuge System growth has come from the need to address nationwide operations and maintenance (O&M) backlogs on existing properties. Many refuges, including Great Meadows NWR, are not fully staffed under current budgets and have significant O&M backlogs. Expanding boundaries creates a need for additional staff, O&M funds, as well as additional dollars for the land protection itself. Our Director has asked that we focus, in the interim, on acquiring inholdings within already approved boundaries, which is our proposal under all alternatives for these three refuges. Additionally, we may make slight modifications to our boundary to acquire additional lands of high resource value adjacent to the refuge, if we have a willing seller.

In the future, we may look at wetland, upland and river systems near Great Meadows NWR which are of interest for possible private-lands habitat improvement projects, easements, and/or acquisition. In particular, we believe protection of lands associated with the Sudbury, Assabet and

Concord River watershed is important for the health of fish and wildlife on the refuge.

The Service's land acquisition policy is to obtain the minimum interest necessary to satisfy refuge objectives. Conservation easements can sometimes be used in this context, when they can be shown to be a cost-effective method of protection. In general, conservation easements must preclude destruction or degradation of habitat, and allow refuge staff to adequately manage uses of the area for the benefit of wildlife. Because development rights must be included, the cost of purchasing conservation easements often approaches that of fee title purchase, thus rendering this method less practical.

Vernal Pool: Photo by Rob Vincent

We will continue to protect and acquire lands within the present acquisition boundary at Great Meadows NWR. Donations of easements or voluntary deed restrictions prohibiting habitat destruction would be encouraged. In addition, the Service could negotiate management agreements with local and State agencies, and accept conservation easements on upland tracts.

Funding for land acquisition comes from the Land and Water Conservation Fund and the Migratory Bird Conservation Fund under the Migratory Bird Conservation Act.

Resource Protection and Visitor Safety

Protection of visitors and both natural and cultural resources will be improved. We propose to increase refuge staff by one additional, full-time Park Ranger, and provide the necessary, intensive federal law enforcement training required for dual function law enforcement responsibilities to two additional staff (e.g., an assistant manager, refuge operations specialist, or an outdoor recreation planner).

Refuge staff will complete a fire suppression contract or agreement with state or local fire suppression agencies for wildfires occurring on the refuge (see section Fire Management at the beginning of this chapter).

Special Use Permits and Memorandum of Understanding and Agreement

Guided tours, by outside groups, are permitted on the refuges if the activity is determined to be appropriate and compatible with the refuge(s) purpose. Permitting will be divided into four categories by the type of use and the regularity of the activity requested. Where appropriate, one Permit or Agreement will be developed for all three northern refuges in the Complex including Oxbow, Assabet River and Great Meadows NWRs.

Special Use Permits may be issued to user groups or individuals for annual

or single events. These organizations or individuals are those who want to use the refuges for a special purpose (e.g. commercial photographer, special event or research study), or to gain access to an area otherwise closed to the public (e.g. one time entrance to closed areas to film/photograph special event or hold special wildlife celebration day on refuge). Groups will be given specific requirements and educational guidelines on materials to present to the public. The specific charge and specific requirements will be determined on a case by case basis.

A Memorandum of Understanding (MOU) or Memorandum of Agreement (MOA) may be issued to user groups/individuals who want to use the refuges for a special purpose or gain access to an area otherwise closed to the public, on a regular basis or annually. Groups will be given specific requirements and educational guidelines on materials to present to the public. The specific charge and specific requirements will be determined on a case-by-case basis.

A concession may be developed if a business operated by private enterprise is providing a public service (recreational, educational and interpretive enjoyment of our lands and waters for the visiting public), and generally requires some sort of capital investment. Concessionaires will generally gross a minimum of $1,000 and the concession will be charged either a fixed franchise fee or a percent of gross income. Groups will also be given specific requirements and educational guidelines on materials to present to the public.

Research

The Service encourages and supports research and management studies on refuge lands that improve and strengthen natural resource management decisions. The Refuge Manager encourages and seeks research relative to approved refuge objectives that clearly improves land management, promotes adaptive management, addresses important management issues or demonstrates techniques for management of species and/or habitats. Priority research addresses information that will better manage the Nation's biological resources and is generally considered important to: Agencies of the Department of Interior; the Service; the Refuge System; and State Fish and Game Agencies, or important management issues for the refuge.

We will consider research for other purposes, which may not directly relate to refuge specific objectives, but may contribute to the broader enhancement, protection, use, preservation and management of native populations of fish, wildlife and plants, and their natural diversity within the region or flyway. These proposals must still pass the Service's compatibility policy.

We will maintain a list of research needs that will be provided to

prospective researchers or organizations upon request. Our support of research directly relates to refuge objectives and may take the form of: funding, in-kind services such as housing or use of other facilities, direct staff assistance with the project in the form of data collection, provision of historical records, conducting of management treatments, or other assistance as appropriate.

All researchers on refuges, current and future, will be required to submit research proposals which include a detailed research proposal following Service Policy FWS Refuge Manual Chapter 4 Section 6. All proposals must be submitted at least three months prior to the requested initiation date of the project. Special Use Permits must also identify a schedule for annual progress reports. The Regional Refuge biologists, other Service Divisions and State agencies may be asked to review and comment on proposals.

Concord River: Photo by Catherine Ross

Wild and Scenic River Designation

Great Meadows NWR protects 12 miles of the Concord and Sudbury Rivers, which are designated under the Wild and Scenic Rivers Act. We will continue to work with our partners to implement, review and update the River Conservation Plan, which was adopted in 1999, as required by the establishing act. We have also identified funding needs in our Refuge Operations Needs System (RONS) (See Appendix E) for both biological and interpretive programs to enhance our management and conservation of these two rivers where they flow through/by the refuge. None of the management actions violate the guidelines for Wild and Scenic river designations. For additional information on this designation log onto http://www.nps.gov/rivers/wsr-suasco.html.

Chapter 5: Refuge Administration

The Great Meadows NWR runs along the Concord and Sudbury Rivers from Framingham to Billerica. The refuge is managed as two separate Divisions. The Concord Division encompasses lands in the towns of Billerica, Bedford, Carlisle, and Concord. The Sudbury Division encompasses lands in Concord, Lincoln, Sudbury, and Wayland.

The refuge will remain a single administrative unit with two divisions. The building which currently serves as the headquarters and visitor contact station will be converted to a purely administrative building upon completion of a visitor center at a separate, to-be-determined, location.

Refuge Staffing

The eight Eastern Massachusetts NWRs are managed as a Complex, with centrally stationed staff taking on duties at multiple refuges.

The refuge is one of eight refuges managed under the Complex. This refuge is one of two staffed offices within the Complex and houses the Refuge Complex Headquarters and administrative personnel at the Sudbury office (see Appendix G for complete staffing chart). Within 3 years, we will attempt to gain approval to fill the following vacancies at Great Meadows NWR.

Refuge Manager	sets goals and objectives for the refuge and establishes and maintains partnerships,
Interpretive Park Ranger	provides programs for the public, helps maintain visitor facitilities, and conducts environmental education
Field Training Law Enforcement Officer	leads the Complex's law enforcement program
Maintenance Workers (1)	maintain refuge facilities and equipment
Administrative Staff (1)	manage office and secretarial demands on the refuge

Staff assigned to Great Meadows NWR also work on the other seven refuges in the Complex.

Bench at Concord Impoundments: Photo by Joan Ross

We also will continue to recruit 2-4 interns each year to assist with the education interpretation and biology programs. The interns will work between 8-12 weeks, working up to 40 hours each week. Internships could be completed for school credit. Free housing will be offered in the dorm to interns.

Additional staff is needed at Great Meadows NWR to properly manage refuge lands as well as work with partners. By 2015, 14 full-time permanent employees will work at Great Meadows NWR. The refuge staff will include filling all positions described.

Table 5-1: Proposed staffing increases

Position	Description
Biologist	Collects data and work with researchers and develops habitat and wildlife management plans
Biological technician	Collects data and assists biologists
Education Specialist	Oversight of new Visitor Center
Volunteer Coordinator/ Outreach Specialist	Works with local and national partners to assist refuge meets its goals and objectives
Maintenance Worker	Restores habitat as well as maintain new and old facilities and equipment
Park Rangers (3)	Protects refuge resources and visitors (law enforcement person) and staff new facilities

The CCP examines the need for staff specific to the three refuges that were organized under the Draft CCP/EA dated April 2003. A total of 39 full time personnel and a seasonal Biotech are needed to fully implement all three Refuge CCPs. Permanent staff serving all three refuges may be stationed at the Refuge Headquarters in Sudbury, MA. Appendix G identifies currently filled positions, recommended new positions, and the overall supervisory structure. The new positions identified will increase visitor services, biological expertise, and visibility of the Service on refuge lands.

Refuge Funding

Successful implementation of the CCPs for each refuge relies on our ability to secure funding, personnel, infrastructure, and other resources to accomplish the actions identified. Full implementation of the actions and strategies in this CCP would incur one-time costs of $2.7 million. These costs include staffing, major construction projects, and individual resource program expansions. Most of these projects have been identified as Tier 1 or Tier 2 Projects in the Refuge System's Refuge Operations Needs System database (RONS). Appendix F lists RONS projects and their recurring costs, such as salaries, following the first year. Also presented in Appendix F is a list of projects in the Service's current Maintenance Management System (MMS) database for the Complex. Currently, the MMS database lists $6.07 million in maintenance needs for the refuge.

Refuge Buildings and Facilities

The existing Refuge Headquarters, Visitor Contact Station and maintenance buildings are located at the Sudbury Division, at the end of Weir Hill Road, and will be maintained. The comfort station (restroom facilities) at the Concord Division will be open year round and the small shop located in Concord will be maintained as a storage area for heavy equipment. Visitor facilities at the Sudbury Division will be remodeled to provide higher-quality visitor experiences, as funds allow. Two storage barns/buildings are located on Water Row in Sudbury. We will maintain two residences and one dorm facility in Sudbury and one residence in Carlisle.

As part of the Centennial Celebration for the Refuge System, the Service identified ten refuges in the country for new visitor centers. The Complex ranked number three on the Service's list. Refuges were ranked on a number of factors including their need for a facility and potential to provide opportunities for a large audience. The site for the new facility is not identified in this document. However, below are the criteria we will use to identify potential sites. Sites chosen will be evaluated in a later Environmental Assessment. The new center might be located at Great Meadows, Oxbow, or Assabet River NWRs or off-site in the vicinity of one of these refuges. The new facility will house exhibits focusing on a variety of environmental themes as well as refuge management activities. We will implement recommendations for interior facility design from the Complex Project Identification Document, after it is finalized. We will evaluate each potential site with the following criteria:

- Access from a major travel route (Route 2, 128, etc.)
- Access from public transportation
- Accessibility of utilities
- Presence of trust species, habitats or other important resources

- Opportunity for outdoor features associated with center, including interpretive trails
- Topography
- Potential disturbance to habitats
- Presence of hazardous wastes
- Potential impacts to neighbors
- Buffer from current or predicted commercial activity

After the new Visitor Center is built, the current headquarters on Weir Hill Road will be used for administrative purposes only by refuge staff.

In addition to the new visitor center, a visitor contact station will be built at the Concord Division by 2015. The contact station will be a small building for a refuge staff person or volunteer to greet the public and conduct interpretive programs. It may contain a few professionally designed exhibits explaining ongoing management activities at the refuge.

Spring at Great Meadows: Photo by John Grabill

Two new equipment storage areas will be built by 2017. These areas will house large equipment and provide refuge maintenance staff a safe and up to code area to repair and maintain refuge vehicles and equipment. Placement and size of these facilities is still to be determined.

Step-Down Management Plans

The Refuge Manual (Part 4, Chapter 3) lists a number of step-down management plans generally required on most refuges. These plans describe specific management actions refuges will follow to achieve objectives or implement management strategies. Some require annual revisions, such as hunt plans, while others are revised on a 5-to-10 year schedule. Some of these plans require NEPA analysis before they can be implemented. In the case of the Complex, some of the plans are developed for each refuge, while some plans are developed for the Complex with specific sections that pertain to individual refuges. In the following lists, we have identified those plans that are specific to the refuge and those that will be included in an overall Complex plan.

The following plans are either up-to-date or in progress and will be completed within 1-year of issuance of the CCP.

- Habitat Management Plan (Refuge)
- Fire Management Plan (Complex)
- Spill Prevention and Counter Measure Plan (Complex)
- Law Enforcement Management Plan (Complex)

The plans indicated in the following list either need to be initiated or are out-of-date and require complete revision. Additional management plans may be required as future Service policy dictates.

- Habitat and Wildlife Inventory Plan (Refuge)
- Integrated Pest Management Plan (Complex)
- Visitor Services Plan (Complex)
- Energy Contingency Plan (Complex)
- Hunt Plan (Refuge)
- Fishing Plan (Refuge)
- Cultural Resources Management Plan (Complex)
- Migratory Bird Disease Contingency Plan (Complex)
- Safety Management Plan (Complex)
- Continuity of Operations Plan (Complex)
- Sign Plan (Complex)

Maintaining Existing Facilities

Periodic maintenance of existing facilities is critical to ensure safety and accessibility for refuge staff and visitors. Existing facilities include the refuge visitor contact station and offices, maintenance compound, and numerous parking areas, observation platforms, and trails. Many of these facilities are not currently Americans with Disabilities Act (ADA) compliant; upgrading is needed. Appendix F displays the fiscal year (FY) 2004 MMS database list of backlogged maintenance entries for the refuge.

Compatibility Determinations

Federal law and policy provide the direction and planning framework to protect the Refuge System from incompatible or harmful human activities and to ensure that Americans can enjoy Refuge System lands and waters. The Administration Act, as amended by the Refuge Improvement Act, is the key legislation on managing public uses and compatibility. Before activities or uses are allowed on a national wildlife refuge, we must determine that each is a "compatible use." A compatible use is a use that, based on the sound professional judgment of the Refuge Manager, "...will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." "Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety. Except for consideration of consistency with State laws and regulations as provided for in section (m), no other determinations or findings are required to be made by the refuge official under this Act or the Refuge Recreation Act for wildlife-dependent recreation to occur." (Refuge Improvement Act)

Compatibility determinations (CDs) were distributed (in the draft CCP/EA) for a 45 day public review in mid 2003. These CDs have since been approved, and will allow the continuation of the following public use

programs: wildlife observation and photography, environmental education and interpretation, fishing, and hunting. Since releasing the draft CCP/EA, we have also distributed CDs for scientific research, motorized boating, and jogging for a public review period. All comments were considered and utilized in the revision. These new CDs are now final and included in Appendix H.

Additional CDs will be developed when appropriate new uses are proposed. CDs will be re-evaluated by the Refuge Manager when conditions under which the use is permitted change significantly; when there is significant new information on effects of the use; or at least every 10 years for non-priority public uses. Priority public use CDs will be re-evaluated under the conditions noted above, or at least every 15 years with revision of the CCP. Additional detail on the CD process is in Parts 25, 26, and 29 of Title 50 of the Code of Federal Regulations, effective November 17, 2000.

Monitoring and Evaluation

This Final CCP covers a 15-year period. Periodic review of the CCP is required to ensure that established goals and objectives are being met, and that the plan is being implemented as scheduled. To assist this review process, a monitoring and evaluation program will be implemented, focusing on issues involving public use activities, and wildlife habitat and population management.

Monitoring of public use programs will involve the continued collection and compilation of visitation figures and activity levels. In addition, research and monitoring programs will be established to assess the impacts of public use activities on wildlife and wildlife habitat, assess conflicts between types of refuge uses, and to identify compatible levels of public use activities. We will reduce these public use activities if we determine that incompatible levels are occurring.

We will collect of baseline data on wildlife populations and habitats as described in Chapter 4. This data will update often limited existing records of wildlife species using the refuge, their habitat requirements, and seasonal use patterns. This data will also be used in the evaluation of the effects of public use and habitat management programs on wildlife populations.

We will monitor refuge habitat management programs will for positive and negative impacts on wildlife habitat and populations and the ecological integrity of the ecosystem. The monitoring will be of assistance in determining if these management activities are helping to meet refuge goals. Information resulting from monitoring would allow staff to set more specific and better management objectives, more rigorously evaluate management objectives, and ultimately, make better management

decisions. This process of evaluation, implementation and reevaluation is known simply as "adaptive resource management".

Sunrise at Great Meadows NWR: Photo by Sue Abrahamsen

Monitoring and Evaluation for this CCP will occur at two levels. The first level, which we refer to as implementation monitoring, responds to the question, "Did we do what we said we would do, when we said we would do it?" The second level of monitoring, which we refer to as effectiveness monitoring, responds to the question, "Are the actions we proposed effective in achieving the results we had hoped for?" Or, in other words, "Are the actions leading us toward our vision, goals, and objectives?" Effectiveness monitoring evaluates an individual action, a suite of actions, or an entire resource program. This approach is more analytical in evaluating management effects on species, populations, habitats, refuge visitors, ecosystem integrity, or the socio-economic environment. More often, the criteria to monitor and evaluate these management effects will be established in step-down, individual project, or cooperator plans, or through the research program. The Habitat and Wildlife Inventory and Monitoring Plan, to be completed, will be based on the needs and priorities identified in the HMP.

Adaptive Management

This CCP is a dynamic document. A strategy of adaptive management will keep it relevant and current. Through scientific research, inventories and monitoring, and our management experiences, we will gain new information which may alter our course of action. We acknowledge that our information on species, habitats, and ecosystems is incomplete, provisional, and subject to change as our knowledge base improves.

Objectives and strategies must be adaptable in responding to new information, as well as changes in time and location. We will continually evaluate management actions, through monitoring or research, and to reconsider whether their original assumptions and predictions are still valid. In this way, management becomes an active process of learning "what really works". It is important that the public understand and appreciate the adaptive nature of natural resource management.

The Refuge Manager is responsible for changing management actions or objectives if they do not produce the desired conditions. Significant changes may warrant additional NEPA analysis; minor changes will not, but will be documented in annual monitoring, project evaluation reports, or the annual refuge narratives.

Additional NEPA Analysis

NEPA requires a site specific analysis of impacts for all federal actions. These impacts are to be disclosed in either an EA or EIS.

Most of the actions and associated impacts in this plan were described in enough detail in the draft CCP/EA to comply with NEPA, and will not require additional environmental analysis. Although this is not an all-inclusive list, the following programs are examples that fall into this category: protecting wildlife habitat, implementing priority wildlife-dependent public use programs, acquiring land, and controlling invasive plants.

Other actions are not described in enough detail to comply with the site-specific analysis requirements of NEPA. Examples of actions that will require a separate EA include: construction of a new visitor center and headquarters, and future habitat restoration projects not fully developed or delineated in this document. Monitoring, evaluation, and research can generally be increased without additional NEPA analysis.

Plan Amendment and Revision

Periodic review of the CCP will be required to ensure that objectives are being met and management actions are being implemented. Ongoing monitoring and evaluation will be an important part of this process. Monitoring results or new information may indicate the need to change our strategies.

The Service's planning policy (FWS Manual, Part 602, Chapters 1, 3, and 4) states that CCPs should be reviewed at least annually to decide if they require any revisions (Chapter 3, part 3.4 (8)). Revisions will be necessary if significant new information becomes available, ecological conditions change, major refuge expansions occur, or when we identify the need to do so during a program review. At a minimum, CCPs will be fully revised every 15 years. We will modify the CCP documents and associated management activities as needed, following the procedures outlined in Service policy and NEPA requirements. Minor revisions that meet the criteria for categorical exclusions (550 FW 3.3C) will only require an Environmental Action Statement.

Literature Cited

Begley, William and Duncan Ritchie. 1998 Intensive (Locational) Archaeological Survey: Robinson Well Project Area, Mhc No. 20211, Concord, Ma. Prepared by The Public Archaeology Laboratory, Inc. Rhode Island for Weston and Sampson Engineers, Inc. Peabody, Ma.

Bolian, Charles R., Scott Dillon and Eugene Winter. 1982. A Cultural Resources Survey of the Great Meadows National Wildlife Refuge, Massachusetts. Report prepared for U.S. Fish and Wildlife Service, Region V, One Gateway Center, Newton, Massachusetts and Interagency Archaeological Services, Atlanta.

Clarke, F. 2000. SUASCO (Sudbury, Assabet and Concord) River Watershed Biodiversity Protection and Stewardship Plan. Francis H. Clark. Under the Massachusetts Watershed Initiative of the Executive Office of Environmental Affairs.
Commonwealth of Massachusetts. 2000. http://www.state.ma.us/index.html

Department of Revenue. 2000. Commonwealth of Massachusetts, Division of Local Services, Municipal Data Bank.

Dincauze, D.F. 1974. An Introduction to the Archaeology of the Greater Boston Area, Archaeology of Eastern North America, Vol. 2, No.1.

Dincauze, D.F. 1976. The Neville Site: 8,000 Years at Amoskeag...Peabody Museum Monographs 4. Cambridge.

Dincauze, D.F. 1981. Paleoenvironmental Reconstruction in the Northeast: the Art of Multidisciplinary Science. in Foundations in Northeast Archaeology, Edited By Dean R. Snow, pp 51-96.

Dincauze, D.F. 1993. Paleoindians in the Eastern Forest. in From Kostenki to Clovis: Upper Paleolithic-Paleo-Indian Adaptations, Edited by O. Soffer And N. D. Praslov. New York: Plenum. pp. 199-218.

Dincauze, D.F. And M.T. Mullholland. 1977. Early and Middle Archaic Site Distributions and Habitats in Southern New England. Annals of the New York Academy of Sciences 288: 439-456.

Dineen, Debbie. 2001. Personal Communication. Spring, 2001.

Eaton, L. and K. Carr. 1991. Contaminant Levels in the Sudbury River, Massachusetts. Final Report Number FY91-NEFO-2-EC.

Ells, Stephen. 2002. *A Bibliography of the Biodiversity and Natural History of the Sudbury River-Concord River Valley, including Great Meadows, the Estabrook Woods and Walden Woods*. Lincoln, MA.

Hudson, A. 1889. History of the Town of Sudbury. Town of Sudbury, Ma.

Marine Mammal Protection Act of 1972. (16 U.S.C. § 1361 Et Seq.)

Massachusetts Audubon Society. 2003. http://www.massaudubon.org/Birds-&-Beyond/iba-intro.html

Massachusetts Department of Environmental Quality Engineering. 1981. SUASCO River Basin Water Quality Management Plan. 94pp.

Massachusetts Department of Environmental Protection. 1998a. Surface Water Quality Standards: 314 CMR 4.03. Division of Water Pollution Control.

Massachusetts Department of Environmental Protection. 1999. Final Massachusetts Section 303(D) List of Waters 1998. Division of Watershed Management. Worcester, MA

Massachusetts Department of Environmental Protection. 2000. Massachusetts 1999 Annual Air Quality Report. Air Assessment Branch, Wall Experiment Station, 37 Shattuck Street, Lawrence, Massachusetts 01843.

Massachusetts Department of Public Health. 1994. Public Health Interim Freshwater Fish Consumption Advisory. Bureau of Environmental Health Assessment. Boston, MA.

Massachusetts Department of Public Health. 1999. Freshwater Fish Consumption Advisory List. Bureau of Environmental Health Assessment. Boston, MA.

Massachusetts Department of Revenue. 2001: http://www.dls.state.ma.us/allfiles.htm

MassWildlife, Natural Heritage And Endangered Species Program and the Massachusetts Chapter of the Nature Conservancy. 1998. Our
Irreplaceable Heritage: Protecting Biodiversity in Massachusetts. 83 pp.

Massachusetts Division of Fish & Game. 2004. MassWildlife Abstract of the 2004 Massachusetts Fish & Wildlife Laws. Undated.

Massachusetts Division of Fisheries & Wildlife, Natural Heritage & Endangered
Species Program, Westborough, Ma.

Massachusetts Executive Office of Environmental Affairs. 1996. SUASCO River Watershed Resource Assessment Report (Draft). 84pp.

Massachusetts Executive Office of Environmental Affairs. 1998. Massachusetts Section 303(D) List of Waters (Final). 131pp.

Massachusetts Executive Office of Environmental Affairs. 2003 Air Quality Report. 88 pp.

Massachusetts Historical Commission, Boston, MA

Massachusetts Historical Commission. 1985. Historic and Archaeological Resources of Central Massachusetts: A Framework for Preservation Decisions. Massachusetts Historical

Commission, Office of the Secretary of State, Boston, MA

McAdow, R. 1990. The Concord, Sudbury, and Assabet Rivers; A Guide to Canoeing, Wildlife and History. Bliss Publishing Company, Inc. Marlborough, MA. 223 pp.

Mello, Mark J. and E. Peters. 1992. Survey of Lepidoptera at Fort Devens, with Notes on Mello, Mark J. and E. Peters. 1994. The Lloyd Center for Environmental Studies, South Dartmouth, Ma. Unpublished Data.

National Park Service. 2001. http://www.nps.gov/rivers/index.html.

National Resources Conservation District. 1995. Middlesex County, Massachusetts Interim Soil Survey Report. Westford, Massachusetts. 4th Edition, 123 pp.

National Weather Service. 2001.

National Wildlife Refuge Improvement Act of 1997. (16 U.S.C. § 668dd Et Seq.)

O'Steen, Lisa. 1987. Cultural Resource Literature and Research Review for the Proposed Pelham Mainline Branch of the Champlain Gas Pipeline Corridor: New Hampshire And Massachusetts. Garrow & Associates, Inc. submitted to ERT. Inc., Concord, Ma.

Plagge, L. 2000. Observations by Lisa Plagge During 2000 Field Season, Biological Technician at USFWS Great Meadows NWR.

Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC 20233. Contact: Statistical Information Staff, Population Division, U.S. Census Bureau (301) 457-2422

Public Law 104-106. National Defense Authorization Act for Fiscal Year 1996, February 10, 1996.

Ritchie, Duncan. 1980. Cultural Resources Survey. Great Meadows National Wildlife Refuge, Sudbury, Massachusetts. prepared by Public Archaeology Laboratory, Department of Anthropology, Brown University, for U. S. Fish and Wildlife Service. Submitted to Heritage Conservation And Recreation Service, Interagency Archaeological Services, Atlanta.

Ritchie, Duncan. 1980. Prehistoric Cultural Resources in the Suburban Fringe: A Preliminary Assessment of the Sudbury/Assabet Drainage. In Widening Horizons, Studies Presented to Maurice Robbins, Edited By C. Hoffman; Trustees of the Massachusetts Archaeological Society, Attleboro, MA.

Ritchie, Duncan. 1984. Musketaquied, 8,000 B.P.: Early Archaic Settlement and Resource Use in the Sudbury/Concord River Drainage. Paper presented at 24th Annual Meeting of the Northeastern Anthropological Association, Hartford, CT.

Ritchie, Duncan. 1985. Archaeological Investigations at the Hartford Avenue Rockshelter, Uxbridge, Massachusetts: The Data Recovery Program. The Public Archaeology Laboratory, Inc. Report No. 40-2. Submitted to the Massachusetts, Department of Public Works, Boston, MA.

Ritchie, Duncan. 1985 Archaeological Investigations of a Maintenance Building Site, Weir Hill Tract, Great Meadows National Wildlife Refuge, Sudbury, Massachusetts. Prepared By Public Archaeology Laboratory, Providence, Rhode Island for U. S. Fish and Wildlife Service, One Gateway Center, Suite 700, Newton Corner, MA.

Ritchie, Duncan and Ann Davin 1984 An Intensive Level Archaeological Survey of the Town of Bedford Water Treatment Facilities, Bedford, Massachusetts. Prepared by Public Archaeology Laboratory, Inc. Providence, Rhode Island, for Camp, Dresser and Mckee, Boston, Ma.

Roberts, David. 1995. Geology, Eastern North America. Peterson Field Guides. Roger T. Peterson (Editor). Houghton Mifflin CO. New York, N.Y. 368 pp.

Rowlett, Gregory. 1985. An Intensive Inventory for a New Shop Complex on the Weir Hillelbanobscott Tract, Great Meadows National Wildlife Refuge, Massachusetts. Performed by Region 6, U.S. Fish And Wildlife Service, Regional Historian Archaeologist, Denver, CO.

Save Our Heritage. 1999. http://www.saveourheritage.com.

Semel, B. and P.W. Sherman. 1995. Alternative Placement Strategies for Wood Duck Nest Boxes. Wildlife Society Builletin 23: 463-471.

Sudbury River Basin Water Quality Survey. 1994. Massachusetts Department of Environmental Protection. 22pp.

Sweet C.W. and E. Prestbo. 1999. Wet Deposition of Mercury in the U.S. and Canada. Presented at "Mercury In The Environment Specialty Conference", September 15-17, 1999, Minneapolis, Mn. Proceedings Published by Air and Waste Management Association, Pittsburgh, PA

University of Connecticut. 2000. A Provisional List of Non-Native Invasive and Potentially Invasive Plants in New England. Leslie J. Merhoff, University of Connecticut. January 1, 2000: http://www.eeb.uconn.edu/bioconctr/publications/publication-3.html

U.S. Census Bureau. 2001. Census 2000 Data: http://factfinder.census.gov

U.S. Department of Agriculture. 1995. Interim Soil Survey of Middlesex County Massachusetts. Natural Resource Conservation Service. Published by the Middlesex County Conservation District, July, 1995.

U.S. Department of Agriculture. 1985. Soil Survey of Worcester County Massachusetts, Northeastern Part. Soil Conservation Service (Now the Natural Resource Conservation Service).

U.S. Department of Interior. 2003. Recreation Fee Demonstration Program. http://www.ios.doi.gov/nrl/recfees/recfee.htm

U.S. Environmental Protection Agency. 2001. Office of Air Quality Planning and Standards "Airs Graphics" Web Site At http://www.epa.gov

U.S. Fish and Wildlife Service. 1985. Refuge Manual. Wash., D.C. U.S. Gov't Printing Office.

U.S. Fish and Wildlife Service. 1992. Fisheries USA. The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service. Wash, D.C.,U.S. Gov't Printing Office.

U.S. Fish and Wildlife Service. 1997a. Recreation Fee Programs Frequently Asked Questions.

U.S. Fish and Wildlife Service. 2000b. Nongame Birds of Management Concern, 1995 List: http://migratorybirds.fws.gov/reports/speccon

U.S. Fish and Wildlife Service. 2000c. Final Compatibility Regulations and Final Compatibility Policy Pursuant to the National Wildlife Refuge System Improvement Act of 1997. 50 CFR Parts 25, 26 and 29

U.S. Fish and Wildlife Service. 2001. Policy on Maintaining Biological Integrity, Diversity, and Environmental Health of the National Wildlife Refuge System. http://policy.fws.gov/library/01FR3809.

Wilson, J. 1988. Archaeological Survey for Three Small Projects: Sudbury Unit, Great Meadows National Wildlife Refuge. Prepared by Regional Archaeologist, Region 5, U.S. Fish and Wildlife Service, 1 Gateway Center, Suite 700 Newton Corner, MA.

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Glossary

accessibility- the state or quality of being easily approached or entered, particularly as it relates to the Americans with Disabilities Act.

accessible facilities- structures accessible for most people with disabilities without assistance; ada-accessible (e.g., parking lots, trails, pathways, ramps, picnic and camping areas, restrooms, boating facilities (docks, piers, gangways), fishing facilities, playgrounds, amphitheaters, exhibits, audiovisual programs, and wayside sites.)

adaptive management- responding to changing ecological condiditions so as to not exceed productivity limits of specific place. For example, when crop growth slows, a good farmer learns to recognize ecological signs that tell either to add more manure or to allow a field to lie fallow. Adaptive management becomes impossible when managers are forced to meet the demands of outsiders who are not under local ecological constraints (from Dodson et al., 1998)

agricultural land- nonforested land (now or recently orchards, pastures, or crops)

alternative- a reasonable way to fix an identified problem or satisfy a stated need (40 cfr 1500.2 (cf. "management alternative"))

amphidromous fish- fish that can migrate from fresh water to the sea or the reverse, not only for breeding, but also regularly at other times during their life cycle

anadromous fish- fish that spend a large portion of their life cycle in the ocean and return to freshwater to breed

aquatic- growing in, living in, or dependent upon water

aquatic barrier- any obstruction to fish passage

appropriate use- a proposed or existing use of a national wildlife refuge that (1) supports the refuge system mission, the major purposes, goals or objectivies of the refuge; (2) is necessary for the safe and effective conduct of a priority general public use on the refuge; (3) is otherwise determined under service manual chapter 605 FW 1 (draft), by the refuge manager and refuge supervisor to be appropriate

area of biological significance- cf. "special focus area"

best management practices- land management practices that produce desired results (n.b. usually describing forestry or agricultural practices effective in reducing non-point source pollution, like reseeding skidder trails or not storing manure in a flood plain. In its broader sense, practices that benefit target species.)

biological or natural diversity- the variety of life in all its forms

breeding habitat- habitat used by migratory birds or other animals during the breeding season

buffer zones- land bordering and protecting critical habitats or water bodies by reducing runoff and nonpoint source pollution loading; areas created or sustained to lessen the negative effects of land development on animals, plants, and their habitats

breeding habitat- habitat used by migratory birds or other animals during the breeding season

candidate species- species for which we have sufficient information on file about their biological vulnerability and threats to propose listing them

carrying capacity- the size of the population that can be sustained by a given environment

catadromous fish- fish that spend most of their lives in fresh water, but migrate to sea to reproduce

categorical exclusion- (CE, CX, CATEX, CATX) pursuant to the National Environmental Policy Act (NEPA), a category of federal agency actions that do not individually or cumulatively have a significant effect on the human environment (40 CFR 1508.4)

CFR- the Code of Federal Regulations

Challenge Cost Share Program- a service administered grant program that provides matching funds for projects supporting natural

resource education, management, restoration, or protection on service lands, other public lands, and private lands

community- the locality in which a group of people resides and shares the same government

community type- a particular assemblage of plants and animals, named for its dominant characteristic

compatible use- "a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the system or the purposes of the refuge."—National Wildlife Refuge System Improvement Act of 1997 (public law 105-57; 111 stat. 1253)

compatibility determination- a required determination for wildlife-dependent recreational uses or any other public uses of a refuge before a use is allowed

Comprehensive Conservation Plan- a document mandated by the National Wildlife Refuge System Improvement Act of 1997 that describes desired future conditions for a refuge unit, and provides long-range guidance for the unit leader to accomplish the mission of the system and the purpose(s) of the unit (p.l. 105-57; FWS manual 602 FW 1.4)

concern- cf. "issue"

conservation- managing natural resources to prevent loss or waste (n.b. management actions may include preservation, restoration, and enhancement.)

conservation agreements - voluntary written agreements among two or more parties for the purpose of ensuring the survival and welfare of unlisted species of fish and wildlife or their habitats or to achieve other specified conservation goals.

conservation easement- a legal agreement between a landowner and a land trust (e.g., a private, nonprofit conservation organization) or government agency that permanently limits uses of a property to protect its conservation values

cool-season grass- introduced grass for crop and pastureland that grows in spring and fall and is dormant during hot summer months

cooperative agreement- the legal instrument used when the principal purpose of a transaction is the transfer of money, property, services, or anything of value to a recipient in order to accomplish a public purpose authorized by federal statute, and substantial involvement between the service and the recipient is anticipated (cf. "grant agreement")

cultural resource inventory- a professional study to locate and evaluate evidence of cultural resources present within a defined geographic area (n.b. various levels of inventories may include background literature searches, comprehensive field examinations to identify all exposed physical manifestations of cultural resources, or sample inventories for projecting site distribution and density over a larger area. Evaluating identified cultural resources to determine their eligibility for the National Register of Historic Places follows the criteria in 36 CFR 60.4 (cf. FWS manual 614 FW 1.7).)

cultural resource overview- a comprehensive document prepared for a field office that discusses, among other things, project prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement of how program objectives should be met and conflicts resolved (an overview should reference or incorporate information from a field offices background or literature search described in section viii of the Cultural Resource Management Handbook (FWS manual 614 FW 1.7).)

dedicated open space- land to be held as open space forever

designated wilderness area- an area designated by Congress as part of the National Wilderness Preservation System (FWS Manual 610 FW 1.5 (draft))

diadromous- fish that migrate from freshwater to saltwater or the reverse; a generic term that includes anadromous, catadromous, and amphidromous fish

easement- an agreement by which landowners give up or sell one of the rights on their property (e.g., landowners may donate rights-of-way

across their properties to allow community members access to a river (cf. "conservation easement").)

ecosystem- a natural community of organisms interacting with its physical environment, regarded as a unit

ecotourism- visits to an area that maintains and preserves natural resources as a basis for promoting its economic growth and development

ecosystem approach- a way of looking at socioeconomic and environmental information based on the boundaries of ecosystems like watersheds, rather than on geopolitical boundaries

ecosystem-based management- an approach to making decisions based on the characteristics of the ecosystem in which a person or thing belongs (n.b. this concept considers interactions among the plants, animals, and physical characteristics of the environment in making decisions about land use or living resource issues.)

emergent wetland- wetlands dominated by erect, rooted, herbaceous plants

endangered species- a federal- or state-listed protected species that is in danger of extinction throughout all or a significant portion of its range

environmental education- "…education aimed at producing a citizenry that is knowledgeable about the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution."—Stapp et al. 1969

Environmental Assessment- (EA) a concise public document that briefly discusses the purpose and need for an action, its alternatives, and provides sufficient evidence and analysis of its impacts to determine whether to prepare an Environmental Impact Statement or Finding of No Significant Impact (q.v.) (cf. 40 CFR 1508.9)

Environmental Impact Statement- (EIS) a detailed, written analysis of the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (cf. 40 CFR 1508.11)

estuaries- deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed or sporadic access to the ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from land

estuarine wetlands- "the estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land."—Cowardin et al. 1979

exemplary community type- an outstanding example of a particular community type

extirpated- no longer occurring in a given geographic area

Federal land- public land owned by the Federal Government, including national forests, national parks, and national wildlife refuges

Federal-listed species- a species listed either as endangered, threatened, or a species at risk (formerly, a "candidate species") under the Endangered Species Act of 1973, as amended

Finding of No Significant Impact- (FONSI) supported by an Environmental Assessment, a document that briefly presents why a Federal action will have no significant effect on the human environment, and for which an Environmental Impact Statement, therefore, will not be prepared (40 CFR 1508.13)

fish passage project- providing a safe passage for fish around a barrier in the upstream or downstream direction

focus areas- cf. "special focus areas"

forbs- flowering plants (excluding grasses, sedges, and rushes) that do not have a woody stem and die back to the ground at the end of the growing season

forested land- land dominated by trees

forested wetlands- wetlands dominated by trees

Geographic Information System- (GIS) a computerized system to compile, store, analyze and display geographically referenced information (e.g., GIS can overlay multiple sets of information on the distribution of a variety of biological and physical features.)

grant agreement- the legal instrument used when the principal purpose of the transaction is the transfer of money, property, services, or anything of value to a recipient in order to accomplish a public purpose of support or stimulation authorized by federal statute and substantial involvement between the service and the recipient is *not* anticipated (cf. "cooperative agreement")

grassroots conservation organization- any group of concerned citizens who come together to actively address a conservation need

habitat fragmentation- the breaking up of a specific habitat into smaller, unconnected areas (n.b. a habitat area that is too small may not provide enough space to maintain a breeding population of the species in question.)

habitat conservation- protecting an animal or plant habitat to ensure that the use of that habitat by the animal or plant is not altered or reduced

habitat- the place where a particular type of plant or animal lives

hydrologic or flow regime- characteristic fluctuations in river flows

important fish areas- the aquatic areas identified by private organizations, local, state, and federal agencies that meet the purposes of the Conte act

informed consent- "…the grudging willingness of opponents to go along with a course of action that they actually oppose."—Bleiker

Intergrated Pest Management (IPM)- sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks

interjurisdictional fish- populations of fish that are managed by two or more states or national or tribal governments because of the scope of their geographic distributions or migrations

interpretive facilities- structures that provide information about an event, place, or thing by a variety of means, including printed, audiovisual, or multimedia materials (e.g., kiosks that offer printed materials and audiovisuals, signs, and trail heads.)

interpretive materials- any tool used to provide or clarify information, explain events or things, or increase awareness and understanding of the events or things (e.g., printed materials like brochures, maps or curriculum materials; audio⁄visual materials like video and audio tapes, films, or slides; and, interactive multimedia materials, CD-Rom or other computer technology.)

interpretive materials projects- any cooperative venture that combines financial and staff resources to design, develop, and use tools for increasing the awareness and understanding of events or things related to a refuge

introduced invasive species- non-native species that have been introduced into an area and, because of their aggressive growth and lack of natural predators, displace native species

issue- any unsettled matter that requires a management decision (e.g., a service initiative, an opportunity, a management problem, a threat to the resources of the unit, a conflict in uses, a public concern, or the presence of an undesirable resource condition.)

Issues Workbook- a packet of questions distributed in order to solicit public comments on the Refuge Complex and the planning process. Basic information on the Refuge Complex was bundled with the Issues Workbooks. Workbooks were not randomly distributed, nor were questions intended to have statistical significance.

lacustrine wetlands- "the lacustrine system includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; and (3) total area exceeds eight ha (20 acres)."—Cowardin et al. 1979

land trusts- organizations dedicated to

conserving land by purchase, donation, or conservation easement from landowners

limiting factor- an environmental limitation that prevents further population growth

local land- public land owned by local governments, including community or county parks or municipal watersheds

local agencies- generally, municipal governments, regional planning commissions, or conservation groups

long-term protection- mechanisms like fee title acquisition, conservation easements, or binding agreements with landowners that ensure land use and land management practices will remain compatible with maintaining species populations over the long term

management alternative- a set of objectives and the strategies needed to accomplish each objective (FWS Manual 602 FW 1.4)

management concern- cf. "issue"; "migratory nongame birds of management concern"

management opportunity- cf. "issue"

management plan- a plan that guides future land management practices on a tract

management strategy- a general approach to meeting unit objectives (n.b. a strategy may be broad, it may be detailed enough to guide implementation through specific actions, tasks, and projects (FWS Manual 602 FW 1.4).)

mesic soil- sandy-to-clay loams containing moisture retentive organic matter, well drained (no standing matter)

migratory nongame birds of management concern- species of nongame birds that (*a*) are believed to have undergone significant population declines; (*b*) have small or restricted populations; or (*c*) are dependent upon restricted or vulnerable habitats

mission statement- a succinct statement of the purpose for which the unit was established; its reason for being

mitigation- actions taken to compensate for the negative effects of a particular project (e.g., wetland mitigation usually restores or enhances a previously damaged wetland or creates a new wetland.)

National Environmental Policy Act of 1969- (NEPA) requires all Federal agencies to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in planning and implementing environmental actions (Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decisionmaking (cf. 40 CFR 1500).)

National Wildlife Refuge Complex- (Complex) an internal Service administrative linking of refuge units closely related by their purposes, goals, ecosystem, or geopolitical boundaries.

National Wildlife Refuge System- (System) all lands and waters and interests therein administered by the Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish and wildlife, including those that are threatened with extinction

native plant- a plant that has grown in the region since the last glaciation and occurred before European settlement

non-consumptive, wildlife-oriented recreation- wildlife observation and photography and environmental education and interpretation (cf. "wildlife-oriented recreation")

non-point source pollution- nutrients or toxic substances that enter water from dispersed and uncontrolled sites

nonforested wetlands wetlands dominated by shrubs or emergent vegetation

Notice of Intent- (NOI) an announcement we publish in the Federal Register that we will prepare and review an Environmental Impact Statement (40 CFR 1508.22)

objective- a concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining

strategies, monitoring refuge accomplishments, and evaluation the success of strategies. Make objectives attainable, time-specific, and measurable.

occurrence site- a discrete area where a population of a rare species lives or a rare plant community type grows

old fields - areas formerly cultivated or grazed, where woody vegetation has begun to invade (n.b. if left undisturbed, old fields will eventually succeed into forest. Many occur at sites originally suitable for crops or pasture. They vary markedly in the Northeast, depending on soil and land use and management history.)

outdoor education project- any cooperative venture that combines financial and staff resources to develop outdoor education activities like labs, field trips, surveys, monitoring, or sampling

outdoor education- educational activities that take place in an outdoor setting

palustrine wetlands- "the palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0$."—Cowardin et al. 1979

Partners for Wiildlife Program- a voluntary, cooperative habitat restoration program among the Service, other government agencies, public and private organizations, and private landowners to improve and protect fish and wildlife habitat on private land while leaving it in private ownership

partnership- a contract or agreement among two or more individuals, groups of individuals, organizations, or agencies, in which each agrees to furnish a part of the capital or some service in kind (e.g., labor) for a mutually beneficial enterprise

planning updates- newsletters distributed, primarily through mailing lists,m in order to update the interested public on the status of the CCP project.

population monitoring- assessing the characteristics of populations to ascertain their status and establish trends on their abundance, condition, distribution, or other characteristics

prescribed fire- the application of fire to wildland fuels, either by natural or intentional ignition, to achieve identified land use objectives (FWS Manual 621 FW 1.7)

private land- land owned by a private individual or group or non-government organization

private landowner- cf. "private land"

private organization- any non-government organization

proposed action (or alternative)- activies for which an Environmental Assessment is being written; the alternative containing the actions and strategies recommended by the planning team. The proposed action is, for all proactival purposes, the draft CCP for the refuge.

protection- mechanisms like fee title acquisition, conservation easements, or binding agreements with landowners that ensure land use and land management practices will remain compatible with maintaining species populations at a site (cf. "long-term ~")

public- individuals, organizations, and non-government groups; officials of federal, state, and local government agencies; native american tribes, and foreign nations— includes anyone outside the core planning team, those who may or may not have indicated an interest in the issues and those who do or do not realize that our decisions may affect them

public involvement- offering to interested individuals and organizations that our actions or policies may affect an opportunity to become informed; soliciting their opinions.

public involvement plan- long-term guidance for involving the public in the comprehensive planning process

public land- land owned by the local, state, or Federal government

rare species- species identified for special management emphasis because of their uncommon occurrence

rare community types- plant community types

classified as rare by any state program (as used in CCP's, includes exemplary community types.)

recommended wilderness- areas studied and found suitable for wilderness designation by both the Director (FWS) and Secretary (DOI), and recommended by the President to Congress for inclusion in the National Wilderness System (FWS Manual 610 FW 1.5 (draft))

Record of Decision- (ROD) a concise public record of a decision by a Federal agency pursuant to NEPA (N.b. a ROD includes:•the decision; •all the alternatives considered; •the environmentally preferable alternative; •a summary of monitoring and enforcement, where applicable, for any mitigation ; and, •whether all practical means have been adopted to avoid or minimize environmental harm from the alternative selected (or if not, why not).)

refuge goals- "…descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable units."— Writing Refuge Management Goals and Objectives: A Handbook

refuge mailing list- the "original" Great Meadows Refuge Complex mailling list which preceded the CCP process. This list contained names and addresses of people with an interest in the refuge. As part of the planning process, the list was continually updated to include conservation agencies, sporting clubs, Congressionals, workbook respondents, open house/focus group attendees, etc.

refuge purposes- "the terms 'purposes of the refuge' and 'purposes of each refuge' mean the purposes specified in or derived from the law, proclamation, Executive Order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit."—National Wildlife Refuge System Improvement Act of 1997

refuge lands- lands in which the service holds full interest in fee title or partial interest like an easement

restoration- the artificial manipulation of habitat to restore it to its former condition (e.g., restoration may involve planting native grasses and forbs, removing shrubs, prescribed burning, or reestablishing habitat for native plants and animals on degraded grassland.)

riparian- of or relating to the banks of a stream or river

riparian agricultural land- agricultural land along a stream or river

riparian forested land- forested land along a stream or river (cf. note above)

riparian habitat- habitat along the banks of a stream or river (cf. note above)

riverine- within the active channel of a river or stream

riverine wetlands- generally, all the wetlands and deepwater habitats occurring within a freshwater river channel not dominated by trees, shrubs, or persistent emergents

runoff- water from rain, melted snow, or agricultural or landscape irrigation that flows over a land surface into a water body (cf. "urban runoff")

sandplain grassland- dry grassland that has resisted succession due to fire, wind, grazing, mowing, or salt spray (N.b. Characterized by thin, acidic, nutrient-poor soils over deep sand deposits, sandplains primarily occur on the coast and off-coast islands, or inland, where glaciers or rivers have deposited sands.)

Service presence- service programs and facilities that it directs or shares with other organizations; public awareness of the service as a sole or cooperative provider of programs and facilities

site improvement- any activity that changes the condition of an existing site to better interpret events, places, or things related to a refuge. (e.g., improving safety and access, replacing non-native with native plants, refurbishing footbridges and trail ways, and renovating or expanding exhibits.)

special focus area- an area of high biological value (N.b. fie normally direct most of our resources to SFA's that were delineated because of: 1.the presence of federal-listed endangered and threatened species, species at risk (formerly, "candidate species"), rare species, concentrations of migrating or wintering waterfowl, or

shorebird stopover habitat; 2.their importance as migrant landbird stopover or breeding habitat; 3.the presence of unique or rare communities; or 4.the presence of important fish habitat.)

special habitats- as used in CCP's; wetlands, vernal pools, riparian habitat, and unfragmented rivers, forests and grasslands (N.b. many rare species are dependent on specialized habitats that, in many cases, are being lost within a watershed.)

special riparian project- restoring, protecting, or enhancing an aquatic environment in a discrete riparian corridor within a special focus area

species at risk- a species being considered for Federal listing as threatened or endangered (formerly, "candidate species")

species of concern- species not federal-listed as threatened or endangered, but about which we or our partners are concerned

State agencies- generally, natural resource agencies of State governments

State land- State-owned public land

State-listed species- cf. "Federal-listed species" (N.b. this is how to write the phrase "Federal- and State-listed species".)

step-down management plan- a plan for dealing with specific refuge management subjects, strategies, and schedules, e.g., cropland, wilderness, and fire (FWS Manual 602 FW 1.4)

stopover habitat- habitat where birds rest and feed during migration

telecommunications- communicating via electronic technology

telecommunications project- any cooperative venture that combines financial and staff resources to develop and use computer-based applications for exchanging information about a watershed with others

threatened species- a federal-listed, protected species that is likely to become an endangered species in all or a significant portion of its range

tiering- incorporating by reference the general discussions of broad topics in Environmental Impact Statements into narrower statements of environmental analysis by focusing on specific issues (40 CFR 1508.28)

tributary- a stream or river that flows into a larger stream, river, or lake

trust resource- a resource that the government holds in trust for the people through law or administrative act (N.b. a Federal trust resource is one for which responsibility is given wholly or in part to the Federal government by law or administrative act. Generally, Federal trust resources are nationally or internationally important no matter where they occur, like endangered species or migratory birds and fish that regularly move across state lines. They also include cultural resources protected by Federal historic preservation laws, and nationally important or threatened habitats, notably wetlands, navigable waters, and public lands like state parks and national wildlife refuges.)

unfragmented habitat- large, unbroken blocks of a particular type of habitat

unit objective- desired conditions that must be accomplished to achieve a desired outcome

upland- dry ground (i.e., other than wetlands)

upland meadow or pasture- areas maintained in grass for livestock grazing; hay production areas (N.b. meadows may occur naturally in tidal marshes and inland flooded river valleys or, more frequently, at upland sites where vegetation has been cleared and grasses planted. Eventually, meadows will revert to old fields and forest if they are not mowed, grazed, or burned. Grasses in both managed meadows and pastures usually are similar, but pasture herbs often differ because of selective grazing.)

urban runoff water from rain, melted snow, or landscape irrigation flowing from city streets and domestic or commercial properties that may carry pollutants into a sewer system or water body

vernal pool- depressions holding water for at least two months in the spring or early summer, is absent of fish, and is important for amphibians during the breeding season.

vision statement- a concise statement of what

the unit could achieve in the next 10 to 15 years

visitor center- a permanently staffed building offering exhibits and interpretive information to the visiting publc. Some visitor center are co-located with refuge offices, others include additional facilities such as classrooms or wildlife viewing areas

visitor contact station- compared to a visitor center, a contact station is a smaller facility which may not be permanently staffed

warm-season grass- native prairie grass that grows the most during summer, when cool-season grasses are dormant

watchable wildlife- all wildlife is watchable (N.b. a watchable wildlife program is one that helps maintain viable populations of all native fish and wildlife species by building an active, well informed constituency for conservation. Watchable wildlife programs are tools for meeting wildlife conservation goals while at the same time fulfilling public demand for wildlife-dependent recreational activities (other than sport hunting, sport fishing, or trapping).)

watershed- the geographic area within which water drains into a particular river, stream, or body of water; land and the body of water into which the land drains

well protected- a rare species or community type 75 percent or more of its occurrence sites are on dedicated open space

wet meadows- meadows located in moist, low-lying areas, often dominated by large colonies of reeds or grasses (N.b. often they are created by collapsed beaver dams and exposed pond bottoms. Saltmarsh meadows are subject to daily coastal tides.)

wetlands- "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water."— Cowardin et al 1979

wilderness- cf. "designated wilderness"

wildfire- a free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (FWS Manual 621 FW 1.7)

wildland fire- every wildland fire is either a wildfire or a prescribed fire (FWS Manual 621 FW 1.3)

wildlife management- manipulating wildlife populations, either directly by regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors

wildlife-oriented recreation- recreational experiences in which wildlife is the focus ("the terms 'wildlife dependent recreation' and 'wildlife-dependent recreational use' mean a use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation."— National Wildlife Refuge System Improvement Act of 1997)

working landscape- the rural landscape created and used by traditional laborers (N.b. agriculture, forestry, and fishing all contribute to the working landscape of a watershed (e.g., keeping fields open by mowing or by grazing livestock).)

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Appendices

Appendix A: Relevant Laws
Appendix B: U.S. Forest Service Content Analysis Team Summary Report
Appendix C: Responses to Substantive Comments
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Appendix E: RONS and MMS
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Appendix G: Final Compatibility Determinations

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Appendix A: Relevant Laws

Emergency Wetland Resources Act of 1986

This Act authorized the purchase of wetlands with Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act also requires the Secretary to establish a National Wetlands Priority Conservation Plan, requires the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amount equal to import duties on arms and ammunition.

Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended

Public Law 93-205, approved December 28, 1973, repealed the Endangered Species Conservation Act of December 5, 1969 (P.L. 91-135, 83 Stat. 275). The 1969 Act had amended the Endangered Species Preservation Act of October 15, 1966 (P.L. 89-669, 80 Stat. 926). The 1973 Endangered Species Act provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, both through federal action and by encouraging the establishment of state programs. The act:

- authorizes the determination and listing of species as endangered and threatened;
- prohibits unauthorized taking, possession, sale, and transport of endangered species;
- provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- authorizes the assessment of civil and criminal penalties for violating the act or regulations; and
- authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the act of any regulation issued thereunder.

Executive Order 11988, Floodplain Management

The purpose of this Executive Order, signed May 24, 1977, is to prevent Federal agencies from contributing to the "adverse impacts associated with occupancy and modification of floodplains" and the "direct or indirect support of floodplain development." in the course of fulfilling their respective authorities, Federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Fish and Wildlife Improvement Act of 1978

This Act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the

secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on service projects and appropriations to carry out volunteer programs.

Historic Preservation Acts

There are various laws for the preservation of historic sites and objects.

Antiquities Act (16 U.S.C. 431 - 433) – The Act of June 8, 1906, (34 Stat. 225) authorizes the President to designate as National Monuments objects or areas of historic or scientific interest on lands owned or controlled by the United States. The Act required that a permit be obtained for examination of ruins, excavation of archaeological sites and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army, and provided penalties for violations.

Archaeological Resources Protection Act (16 U.S.C. 470aa - 470ll) -- Public Law 96-95, approved October 31, 1979, (93 Stat. 721) largely supplanted the resource protection provisions of the Antiquities Act for archaeological items.

This Act established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from Federal or Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from Federal or Indian land in violation of any provision of Federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law.

Public Law 100-588, approved November 3, 1988, (102 Stat. 2983) lowered the threshold value of artifacts triggering the felony provisions of the act from $5,000 to $500, made attempting to commit an action prohibited by the Act a violation, and required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act (16 U.S.C. 469-469c) -- Public Law 86-523, approved June 27, 1960, (74 Stat. 220) as amended by Public Law 93-291, approved May 24, 1974, (88 Stat. 174) to carry out the policy established by the historic sites act (see below), directed Federal agencies to notify the Secretary of the Interior whenever they find a Federal or Federally assisted, licensed or permitted project may cause loss or destruction of significant scientific, prehistoric or archaeological data. The Act authorized use of appropriated, donated and/or transferred funds for the recovery, protection and preservation of such data.

Historic Sites, Buildings and Antiquities Act (16 U.S.C 461-462, 464-467) -- The Act of August 21, 1935, (49 Stat. 666) popularly known as the Historic Sites Act, as amended by Public Law 89-249, approved October 9, 1965, (79 Stat. 971) declared it a National policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act. As of January, 1989, 31 national wildlife refuges

contained such sites.

National Historic Preservation Act of 1966 (16 U.S.C. 470-470b, 470c-470n) -- Public Law 89-665, approved October 15, 1966, (80 Stat. 915) and repeatedly amended, provided for preservation of significant historical features (buildings, objects and sites) through a grant-in-aid program to the states. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468-468d).

The Act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in Public Law 94-422, Approved September 28, 1976 (90 Stat. 1319). That Act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.

As of January, 1989, 91 historic sites on national wildlife refuges have been placed on the National Register.

Land and Water Conservation Fund Act of 1948

This Act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies, including the Fish and Wildlife Service.

Migratory Bird Conservation Act of 1929 (16 U.S.C. 715- 715d, 715e, 715f-715r)

This Act established the Migratory Bird Conservation Commission which consists of the Secretaries of the Interior (chairman), Agriculture, and Transportation, two members from the House of Representatives, and an ex-officio member from the state in which a project is located. The Commission approves acquisition of land and water, or interests therein, and sets the priorities for acquisition of lands by the Secretary for sanctuaries or for other management purposes. Under this Act, to acquire lands, or interests therein, the state concerned must consent to such acquisition by legislation. Such legislation has been enacted by most states.

Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. 718-718j, 48 Stat. 452), as amended

The "Duck Stamp Act," as this March 16, 1934, authority is commonly called, requires each waterfowl hunter 16 years of age or older to possess a valid Federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations.

National and Community Service Act of 1990 (42 U.S.C. 12401; 104 Stat. 3127)

Public Law 101-610, signed November 16, 1990, authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Several provisions are of particular interest to the U.S. Fish and Wildlife Service.

American Conservation and Youth Service Corps -- as a Federal grant program established under Subtitle C of the law, the Corps offers an opportunity for young adults between the ages of 16-25, or in the case of summer programs, 15-21, to engage in approved human and natural resources projects which benefit the public or are carried out on Federal or Indian lands.

To be eligible for assistance, natural resources programs will focus on improvement of wildlife habitat and recreational areas, fish culture, fishery assistance, erosion, wetlands protection, pollution control and similar projects. A stipend of not more than 100 percent of the poverty level will be paid to participants. A Commission established to administer the Youth Service Corps will make grants to States, the Secretaries of Agriculture and Interior and the Director of ACTION to carry out these responsibilities.

National and Community Service Act -- Will make grants to states for the creation of full-time and/or part-time programs for citizens over 17 years of age. Programs must be designed to fill unmet educational, human, environmental, and public safety needs. Initially, participants will receive post-employment benefits of up to $1000 per year for part-time and $2500 for full-time participants.

Thousand Points of Light -- Creates a nonprofit Points of Light Foundation to administer programs to encourage citizens and institutions to volunteer in order to solve critical social issues, and to discover new leaders and develop institutions committed to serving others.

National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, 83 Stat. 852) as amended by P.L. 94-52, July 3, 1975, 89 Stat. 258, and P.L. 94-83, August 9, 1975, 89 Stat. 424).

Title I of the 1969 National Environmental Policy Act (NEPA) requires that all Federal agencies prepare detailed environmental impact statements for "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment."

The 1969 statute stipulated the factors to be considered in environmental impact statements, and required that Federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unquantified environmental values are given appropriate consideration, along with economic and technical considerations.

Title II of this statute requires annual reports on environmental quality from the President to the Congress, and established a Council on environmental quality in the Executive Office of the President with specific duties and functions.

National Wildlife Refuge System Administration Act of 1966 (16U.S.C. 668dd-668ee) as amended

This act defines the Refuge System as including wildlife refuges, areas for protection and conservation of fish and wildlife which are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas. The Secretary is authorized to permit any use of an area provided such use is compatible with the major purposes for which such area was established. The purchase considerations for rights-of-way go into the Migratory Bird Conservation Fund for the acquisition of lands. By regulation, up to 40% of an area acquired for a migratory bird sanctuary may be opened to migratory bird hunting unless the Secretary finds that the taking of any species of migratory game birds in more than 40% of such area would be beneficial to the species. The Act requires an Act of Congress for the divestiture of lands in the system, except (1) lands acquired with Migratory Bird Conservation Commission funds, and (2) lands can be removed from the system by land exchange, or if brought into the System by a cooperative agreement, then pursuant to the terms of the agreement.

National Wildlife Refuge System Improvement Act of 1997

Public Law 105-57, amends the National Wildlife System Act of 1966 (16 U.S.C. 668dd-ee), providing guidance for management and public use of the refuge system. The Act mandates that the Refuge System be consistently directed and managed as a national system of lands and waters devoted to wildlife conservation and management.

The Act establishes priorities for recreational uses of the Refuge System. Six wildlife-dependent uses are specifically named in the act: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. These activities are to be promoted on the Refuge System, while all non-wildlife dependant uses are subject to compatibility determinations.

A compatible use is one which, in the sound professional judgment of the Refuge Manger, will not materially interfere with or detract from fulfillment of the Refuge System Mission or refuge purpose(s).

As stated in the Act, “the mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

The act also requires development of a comprehensive conservation plan for each refuge and management of each refuge consistent with the plan. When writing CCP, planning for expanded or new refuges, and when making management decisions, The Act requires effective coordination with other Federal agencies, state fish and wildlife or conservation agencies, and refuge neighbors. A refuge must also provide opportunities for public involvement when making a compatibility determination or developing a CCP.

North American Wetlands Conservation Act (103 Stat. 1968; 16 U.S.C. 4401-4412)

Public Law 101-233, enacted December 13, 1989, provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico.

The Act converts the Pittman-Robertson account into a trust fund, with the interest available without appropriation through the year 2006 to carry out the programs authorized by the Act, along with an authorization for annual appropriation of over $20 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act.

Available funds may be expended, upon approval of the Migratory Bird Conservation Commission, for payment of not to exceed 50 percent of the United States share of the cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on Federal lands). At least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year.

A North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. The Council is to be composed of the Director of the Service, the Secretary of the National Fish and Wildlife Foundation, a State fish and game agency director from each flyway, and three representatives of different nonprofit organizations participating in projects under the Plan or the Act. The Chairman of the Council and one other member serve ex officio on the Commission for consideration of the Council's recommendations.

The Commission must justify in writing to the Council and, annually, to Congress, any decisions not to accept Council recommendations.

Oil Pollution Act of 1990

Public Law 101-380 (33 U.S.C. 2701 et seq.; 104 Stat. 484) established new requirements and extensively amended the Federal Water Pollution Control Act (33 U.S.C. 1301 et. seq.) to provide enhanced capabilities for oil spill response and natural resource damage assessment by the Service. It required Service consultation on developing a fish and wildlife response plan for the National Contingency Plan, input to Area Contingency Plans, review of Facility and Tank Vessel Contingency Plans, and to conduct damage assessments associated with oil spills.

One aspect of particular interest to the service involves the identification of ecologically sensitive areas and the preparation of scientific monitoring and evaluation plans. Research conducted by the Service is to be directed and coordinated by the National Wetland Research Center.

National Wildlife Refuge System Centennial Cct of 2000

This Act paves the way for a special, nationwide outreach campaign. The law calls for a Centennial Commission of distinguished individuals to work with partners in carrying out

the outreach campaign. The law also calls for a long-term plan to address the major operations, maintenance, and construction needs of the Refuge System

These centennial activities will help broaden visibility, strengthen partnerships, and fortify facilities and programs for wildlife and habitat conservation and recreation. They will build a stronghold of support for the National Wildlife Refuge System to sustain it in a new era of both challenge and opportunity.

Refuge Recreation Act of 1962

This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Refuge Revenue Sharing Act (16 U.S.C. 715s)

Section 401 of the Act of June 15, 1935, (49 stat. 383) provided for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges.

Public Law 93-509, approved December 3, 1974, (88 Stat. 1603) required that moneys remaining in the fund after payments be transferred to the Migratory Bird Conservation Fund for land acquisition under provisions of the Migratory Bird Conservation Act.

Public Law 95-469, approved October 17, 1978, (92 Stat. 1319) expanded the revenue sharing system to include National Fish Hatcheries and service research stations. It also included in the Refuge Revenue Sharing Fund receipts from the sale of salmonid carcasses. Payments to counties were established as:

1) on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land; and

2) on land withdrawn from the public domain, 25 percent of net receipts and basic payments under Public Law 94-565 (31 U.S.C. 1601-1607, 90 Stat. 2662), payment in lieu of taxes on public lands.

This amendment also authorized appropriations to make up any difference between the amount in the Fund and the amount scheduled for payment in any year. The stipulation that payments be used for schools and roads was removed, but counties were required to pass payments along to other units of local government within the county which suffer losses in revenues due to the establishment of refuges.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948

This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a Federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.

Rehabilitation Act of 1973 (29 U.S.C. 794)as amended

Title 5 of Public Law 93-112 (87 Stat. 355), signed October 1, 1973, prohibits discrimination on the basis of handicap under any program or activity receiving Federal financial assistance.

The Volunteer and Community Partnership Act

The Volunteer and Community Partnership Act of 1998 brings recognition and additional authorities to the volunteer program and community partnerships, as well as supports education programs. Under this Act, refuges can now more easily conduct business with community partners under the auspices of the newly authorized and streamlined administrative processes. Leveraging Federal dollars and staff, Refuge Managers can operate and construct services through cooperative agreements, deposit donations in individual accounts at the refuge, and match donations.

Youth Conservation Corps Act (16 U.S.C. 1701-1706, 84 Stat. 794)

Public Law 91-378, approved August 13, 1970, declares the YCC pilot program a success and establishes permanent programs within the Departments of Interior and Agriculture for young adults who have attained the age of 15, but not the age of 19, to perform specific tasks on lands and waters administered under jurisdiction of these Secretaries. Within the Fish and Wildlife Service, YCC participants perform various tasks on national wildlife refuges, national fish hatcheries, research stations, and other facilities.

The legislation also authorizes the Secretary of Interior and the Secretary of Agriculture to establish a joint grant program to assist states employing young adults on non-Federal public lands and waters throughout the U.S.

Requires the Secretaries of Interior and Agriculture to prepare a joint report to the President and Congress prior to April 1 of each year.

Wilderness Act of 1964

Public Law 88-577, approved September 3, 1964, directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within national wildlife refuges and national parks for inclusion in the National Wilderness Preservation System.

Appendix B: U.S. Forest Service Content Analysis Team Summary Report

Analysis of Public Comment

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Content
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406-329-3038

U.S. Department of the Interior, Fish & Wildlife Service

The Eastern Massachusetts National Wildlife Refuge Complex

Assabet River, Great Meadows, Oxbow Wildlife Refuges

Draft Comprehensive Conservation Plan and Environmental Assessment

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Introduction

The contracted U.S. Forest Service Content Analysis Team report summarizes public comment submitted on the Draft Comprehensive Conservation Plan and Environmental Assessment (hereafter Draft CCP/EA) prepared to describe the alternatives for the Assabet River, Great Meadows, and Oxbow refuges in the Eastern Massachusetts National Wildlife Refuge Complex. This report provides a narrative review of concerns raised as well as appendices detailing the coding process for reviewing public comments, analyzing demographic information derived from responses, and listing individuals responsible for the analysis. The narrative summary provides an overview of pervasive themes in public sentiment rather than a comprehensive description of each public concern.

Public input on the Draft CCP/EA is documented, analyzed, and summarized using a process called content analysis. This is a systematic method of compiling and categorizing the full range of public viewpoints and concerns regarding a plan or project. This process makes no attempt to treat comments as votes. In no way does content analysis attempt to sway decision makers toward the will of any majority. Content analysis ensures that every comment is considered at some point in the decision process. Content analysis is intended to facilitate good decision-making by helping the planning team to clarify, adjust, or incorporate technical information into the final guidelines. The process facilitates agency response to comment.

All responses (i.e., letters, emails, faxes, oral testimony, and other types of input) are included in this analysis. In the content analysis process, each response is given a unique identifying number, which allows analysts to link specific comments to original letters. Respondents' names and addresses are then entered into a project-specific database program, enabling creation of a complete mailing list of all respondents. The database is also used to track pertinent demographic information such as responses from special interest groups or federal, state, tribal, county, and local governments.

All input is considered and reviewed by an analyst. Comments are then entered into the database. In preparing the final summary analysis, public statements are reviewed again using database printouts. These reports track all coded input and allow analysts to identify a wide range of public concerns and analyze the relationships between them in a narrative summary.

The U.S. Fish and Wildlife Service solicited comments on the Draft CCP/EA from July 20, 2003 to September 3, 2003.

During the comment period, 1,907 responses, oral and written, were received. Twenty-five responses were duplicates; therefore 1882 responses were entered into the comment database. Organized response campaigns (forms) represented 70 percent (1,334 of 1,907) of the total responses.

Summary of Comments

Synopsis

The general tenor of comments is appreciative and laudatory. Typically, respondents endorse Alternative B. While there are many specific exceptions to these trends, the two most common are opposition to new or increased hunting on the refuge, and opposition to proposed limits on non-motorized recreation on the refuge, such as dog-walking and picnicking. Endorsement of Alterative B is often couched with provisos, such as that it eliminate hunting on the refuge.

Where analysts were able to identify unit-specific comments (such as those about the Great Meadows), the database includes that identification; FWS may wish to review unit-specific comments. In general, however, analysts do not discern any appreciable difference in comments addressed to the various units. The overall themes of comments are the same, and most specific suggestions could apply equally to all three refuges. Where site-specific suggestions or concerns are relevant to this summary, they are identified.

Planning Processes

General Planning

Although respondents are generally complimentary of U.S. Fish and Wildlife Service (FWS) staff and the CCP/EA, commentors provide some suggestions and various criticisms of the document. Respondents also request an opportunity to revisit the plan after its implementation and make any necessary changes.

Time frame for planning/length of comment period

Some respondents are disappointed in the comment period, arguing that holding the comment period during the summer months limits the informed input that communities and individuals can give**.** Specifically, the Suasco Watershed Community Council states, "The summer timing of this public review may have inadvertently and unfortunately limited public comment." Also, some respondents want more time to review the "technical and voluminous" conservation plan so that they may submit more informed comments. Respondents are also disappointed that the agency failed to adequately inform the public of the comment period. One respondent from Concord, for example, wanted notice of the comment period posted on the bulletin board at the Great Meadows Refuge. The FWS, some argue, should extend the comment period and improve outreach efforts so that communities and individuals may provide well-informed and useful comments.

Public Involvement

Many respondents feel satisfied with the FWS's level of public involvement and education; they praise the agencies past efforts and eagerly anticipate additional opportunities for interest groups and communities to stay involved in the refuge's management. One Maynard respondent affirms, "Your efforts to involve the local communities are appreciated and should benefit us all." There are, however, a significant number of respondents who believe the FWS could improve their public involvement and education efforts. One individual states, "Community members in the towns abutting the land appear to have very little knowledge about your proposal, and therefore have had very little input." Respondents urge the FWS to hold more public meetings in schools, libraries, senior centers, and town offices, as well as take advantage of the media to improve public involvement and educate communities. "[Great Meadows Refuge] is a wonderful opportunity for public outreach—a place to engage dedicated environmentalists in a dialogue with U.S. Fish and Wildlife and to recruit new support for the service and its mission."

Civic and conservation organizations express interest in collaborating with the FWS on management issues. The City of Marlborough Conservation Commission, for example, would like to work cooperatively with the FWS in managing the Refuge Complex and the Memorial Forest and Desert Natural Area "to enhance biodiversity and wildlife while allowing public access where suitable." Conservation commissions from other towns express

interest in collaborative management as well. Similarly, respondents nominate the Massachusetts Audubon Society, the Trustee of Reservations, the Friends of Assabet River Wildlife Refuge, The Friends of the Oxbow National Wildlife Refuge, The Great Meadows Neighborhood Association, Bay State Trail Riders Association, and the Sudbury Valley Trustees as good candidates for public involvement.

Relationship to Regional Planning Efforts

Respondents ask for clarification of the CCP's compatibility with other regional management efforts, such as: the Maynard Open Space by-law for the Maynard portion of the Sudbury Annex in 1987 and its hunting restrictions; the Freedom's Way Association bill currently before congress to formally designate 43 communities as a national heritage area near the Great Meadows complex; wildlife management and conservation restrictions near Bolton Flats and Devens South Post; the goals of Wild and Scenic River designations; and the original intent of the O'Rourke farm "river reservation."

Statutory Authority

Respondents sometimes address real or perceived conflicts between the CCP and federal or state law. Some respondents remind the FWS that projects proposed "within the Oxbow boundary are subject to the Massachusetts Endangered Species Act," and that the National Wildlife Refuge Improvement Act of 1997 permits hunting as "one of six priority wildlife-dependent uses."

Trust and Integrity

Some respondents question the intent of the agency, and are disappointed that the land management decisions proffered in the CCP do not reflect the historical uses of the land. "I know that I would not have voted for FWS to take the land if I had believed that I would never have access to that property for recreational use. You duped the residents of these towns so that you could get this property," exclaims one respondent.

Other respondents, however, praise the FWS staff and their efforts. These respondents trust the agency to make appropriate land management decisions based on expertise and dedication.

Clarity/Organization of Planning Documents

Many respondents approve of the CCP and commend the agency. "I would like to say that it is an impressive document [and] remarkably well-written," comments one typical respondent. Commentors also support the document's consideration of and compatibility with neighboring areas.

Some respondents express disappointment, however, in the agency's website performance and the size of the electronic document.

Technical & Editorial

Respondents suggest the agency provide clearer, more accurate maps. Respondents also provided editorial suggestions. For example, "Correction: The Commission would like to point out an error on the map on page 2-71. A parking lot is shown on Maple St. north of the service road. This site is in fact a private home. There is a parking lot across the street on Greenough Conservation Land existing there." Another respondent wrote, "Please correct the capitalization on Sudbury section maps 2-6, 2-7, 2-16 to Sherman Bridge Road. It is two words. It's a street in Wayland."

Purpose and Need

Range of Issues

Some respondents feel that FWS is making a mistake in classifying certain issues as beyond the scope of the EA. These respondents want the FWS to evaluate and mitigate noise and air pollution impacts on visitors and wildlife caused by Hanscom Field air traffic. One commentor states, "The CCP should include a plan to evaluate impacts to waterfowl, especially during nesting seasons, from air traffic at Hanscom Field. The CCP should identify noise from Hanscom Field as an issue with which the U.S. Fish and Wildlife staff should be more involved." Respondents protest the expansion of Hanscom Field and its related impacts to the visitor experience; and ask that FWS partner with local communities and federal agencies—the Department of Transportation and the Federal Aviation Administration—to analyze the impacts of the expansion. One conservation organization asks the FWS to participate in the evaluation of jet ski impacts to recreation and wildlife on the Concord River.

Guiding Policy for Public Lands

Respondents repeatedly describe the agency's mission as one of wildlife protection, and assert that human activities and development should be limited. "In establishing the permitted uses for the refuge, you must not bow to public pressure. You must follow the charter of a NWR. To do that, you need to establish what the sensitive species are in the refuge, and how they are best managed. You must define what additional resources should be involved to preserve habitat for the animals. This might include re-establishing topographical features, acquiring adjacent land, procuring easements on neighboring lands, or managing tourists." Respondents emphasize the history of the land and its importance to local communities, and suggest that informed management decisions that benefit biodiversity would best preserve the refuge. To accomplish this, respondents suggest the agency "recognize areas in proximity to the refuge and consider such in managing refuge resources," as wildlife and ecosystems do not recognize political boundaries.

The land that makes up the Assabet River, Great Meadows, and Oxbow Wildlife Refuges is important to the people in the neighboring communities. Many respondents feel connected to the land, historically, spiritually, and personally.

Alternatives

Many respondents either support Alternative A or B, while little is said regarding Alternative C. Proponents of Alternative A are concerned about expanding or limiting specific activities such as hunting and dog-walking. Some of these respondents request not expanding or allowing hunting. Other respondents ask to retain, rather than prohibit, existing "non-wildlife" dependent activities. In general, these respondents desire Refuge Complex management to continue as is.

Respondents support Alternative B more for its management approach than allowed activities. Many of these respondents favor active management for invasive species and wildlife habitat. Additionally, supporters of Alternative B approve of the levels of funding and staffing proposed. Respondents are divided about the benefits of the phased opening of the refuge. Other concerns stemming from Alternative B include additional fees, allowed uses, and land acquisitions. Repeatedly, respondents endorse Alternative B while asking that it permit non-motorized uses such as dog-walking, and prohibit hunting.

Some respondents feel that no alternative considered is adequate. New alternatives suggested include: emphasizing non-consumptive, non-lethal approaches to population control; promoting the refuge as "open space," not a hunting preserve; and providing more local level decision-making.

Affected Environment

General resources

One respondent requests that the FWS include in its bibliography the respondent's publication, "A Bibliography of the Biodiversity and the Natural History of the Sudbury River- Concord River Valley, including the Great Meadows, the Estabrook Woods, and Walden Woods."

One respondent avows support for "projects that deal with restoring the native ecology to the area."

Water quality

One respondent requests protection of water quality and quantity in the Assabet River corridor and drainage. Related to the issue of quantity, one respondent raises the issue of connected aquifers: "Areas outside the scope of the CCP and town water supply wells (Pg. 1-24): Protecting the remaining base flow—the groundwater that supplies flow to the streams during dry times—in the tributaries and main stem of the Assabet River is critical to protecting water quality and aquatic habitat in the watershed . . . therefore, we suggest that any requests for access to the refuges for the purpose of drilling new water supply wells be reviewed for impacts to the wetlands and tributary streams on and off the refuges and suggest using the groundwater model of the Assabet River watershed currently being developed by the US Geological Survey (Northborough) to evaluate potential habitat impacts of proposed increased withdrawals."

One respondent argues that water quality degradation should be a critical part of the CCP/EA, rather than being considered out of scope: "I thought the water quality section was weak. Having raised the red flag that the rivers are heavily contaminated, I did not feel that the text clearly explained what that meant for the public and for wildlife in the refuge, and what the prospects for correction are. For example, I had thought that a major current issue was discharge of excessive nutrients from waste water treatment plants leading eutrophication and low-oxygen conditions."

Vegetation

Respondents request that the FWS complete proposed cover-type maps to assess species occurrence and distribution. One respondent provides extensive advice: "Biological Inventories and Mapping Alternative B calls for a thorough inventory of all species on the refuges: It would be ideal to be that comprehensive. If priorities are needed, we suggest the following order of importance: Reptiles, especially turtles; Complete documentation of vernal pools; Invertebrates: Select representative habitats to inventory macro invertebrates in order to provide a representational picture of invertebrates in the different habitats on the refuge and to identify any rare species. Invertebrates can also serve as indicators of overall

ecosystem health; Benthic macro invertebrates: select representative habitats for river, stream, pond and wetland surveys within the refuge; Field invertebrates: select a methodology that targets representative field types, such as wet meadow and upland field."

Several respondents suggest that the refuge should sustain and enhance grassland and shrubland habitat on all three units to promote early-successional species, many of which are in decline in the Northeast. One respondent suggests creation of a butterfly refuge on the south side of the patrol road running from the Hudson Road gate to the radar station.

Invasives

The need to inventory refuge resources is connected by one respondent to the need to control invasives: "The Service's proposal to complete a comprehensive invasive plant inventory by 2007 will help guide species-specific management. Many exotic and invasive plant species in the watershed have become discouragingly pervasive. SVT recommends that the Service prioritize its efforts on species that are threatening rare habitats, out-competing rare or state-listed species, or are still in low density numbers. The need for exotic species control research is great and the Service's proposal to participate in experimental invasive species control could result in new innovative methods."

Many respondents support efforts to eliminate invasive non-native species. Indeed, a number urge the FWS to help catalyze a regional control effort in cooperation with abutters, state, federal, and town authorities, and non-profits, arguing that, "Without a systematic treatment of this issue, invasive plants will continue to be dispersed throughout the area by wildlife, people, and mechanical means."

Several respondents raise concerns about invasives at Puffer Pond, given new fishing access to Puffer. One respondent writes: "At present Puffer Pond is pristine and free from invasive species such as milfoil and water chestnut that have infected other waterways within Massachusetts, especially in local ponds including nearby Lake Boon. Allowing canoes previously used in these infected waterways increases the probability of infecting Puffer Pond with these invasives. Canoe portage presents still another problem in that Puffer Pond is a fair distance from the existing entrances. If auto canoe portage were allowed to the pond, temporary parking (allowing driving on the refuge proper) for canoe launch would have to be provided. This could (would) become permanent parking because of the undesirability of leaving the canoe and its contents to move the canoe carriers to an approved parking area after launch and then walking back to the canoe launch area."

Concerns about targeted species are raised in two cases: one respondent argues that cattails are native, and should not be removed; a number of respondents argue that mute swans are harmless and should be

Wildlife Management

The most commonly offered input regarding wildlife management reflects an overwhelming sense of community and a desire to harmonize refuge planning efforts with past, present, and future local and regional land management activities. As one respondent summarizes, "The physical configuration and multiple ownership (plus the unique natural history heritage) of

the valley demands a common vision and a systems and team approach. If all the landowners will work together in supporting and adding to the enormous environmental, natural resource and knowledge base that has already been put in place by past generations, the resulting synergy will produce a 'refuge' of far greater proportions and impact than could ever occur if each property owner goes off on his/her own." This sentiment is reflected over and over in comments. Often, people state, "our town" or "our organization" already has wildlife survey data, or "our town/community" wishes to expand its knowledge of natural resources in the area. These respondents encourage FWS to utilize existing data and established management practices when making decisions for the refuge, and frequently urge FWS to "coordinate," "consult," and "share information."

A related theme touched on by many respondents is the quality of wildlife species data provided in the CCP. Respondents request consistently high-quality data, and some respondents request that FWS provide the most up-to-date species information possible.

Some respondents argue that the agency is drifting away from what they perceive to be its central mission: providing "refuge" for wildlife. A number of people assert that in a wildlife refuge, wildlife needs should take precedence over human needs. Echoing this view, many people request that FWS conduct thorough wildlife assessments to determine what kinds of human activities (if any) might be appropriate on the refuge. A number of respondents believe that hunting and trapping for wildlife population control are not appropriate. Some people encourage non-lethal—or at least humane—population control methods.

All respondents who comment on wildlife monitoring support Alternative B; however, these people encourage FWS to provide more detail regarding how, when, and where monitoring will occur.

Refuge Administration

General Suggestions

A number of respondents urge FWS to address refuge management from a regional perspective, encouraging the FWS to integrate refuge management with the management of surrounding lands through community partnerships. Several people ask the FWS to justify splitting the Great Meadows refuge into two units. They argue that this area is all part of one ecosystem and, accordingly, should be managed as one unit.

The few people who address historical and archaeological sites simply ask the FWS to inventory these resources and to preserve and enhance them when possible.

Land Acquisition

Many respondents comment on the proposed land acquisition boundaries, with the majority of people in favor of expanding them. A typical respondent argues that, "In a plan that purports to run for the next 15 years, it seems shockingly shortsighted to limit land acquisition (including through donations) by the refuge." Some respondents suggest that expansion is the best way to protect whole ecosystems and waterways, while others encourage an expanded refuge area to protect threatened and endangered species and wildlife corridors. Some people ask the FWS to include specific areas, such as the former Fort Devens South Post area and parts of the Assebet and Nashua rivers, in the land acquisition boundaries.

Some respondents discourage the FWS from expanding the land acquisition boundaries. Typically these sentiments stem from disagreement with FWS management choices, such as limits on horseback use.

Buildings and Facilities

Respondents voice a myriad of opinions regarding what kinds of buildings and facilities should be provided at the refuge. Suggesting that visitor education is an important component of gaining public support for the refuge, a number of respondents encourage the FWS to build a visitor center or at the least, a contact station. Some of these respondents make more specific suggestions, such as using existing buildings for a contact station/visitor center or locating such a facility at Hudson Road or at Deven's near Jackson Gate. A number of people support the idea of an administration building on the refuge.

Citing the importance of public education, many people ask the FWS to locate kiosks at strategic locations throughout the refuge. Comments regarding refuge parking focus on lot location with many people discouraging parking at Heard Pond. These respondents contend that there has been too much garbage dumping and vandalism at the Heard Pond site to make it a desirable parking place. One respondent asks the FWS to place portable toilets at all parking facilities in the refuge. A number of people support development of an observation deck. A few other specific refuge management suggestions offered by respondents include:

remove barbed wire from the refuge, use smaller information signs, establish a picnic area with a bear-proof garbage can, and construct fire hydrants on White Pond Road and along Sudbury Road.

Staffing and Funding

Although one respondent believes that the refuge should not have rangers because they merely ". . . harass old ladies . . .," most people feel that adequate refuge staffing is essential. While many people assert that Alternative B will meet desired staffing levels, a number of other respondents contend that proposed staffing levels are too low. These people cite anticipated user conflicts, present refuge hazards, and the current downsizing trend in government as reasons to increase proposed staffing levels. Some respondents suggest utilizing community groups and/or to form partnerships with volunteer organizations to supplement staffing needs.

With regard to refuge management funding, the only direction provided by respondents is a request that the FWS ensure its adequacy.

Enforcement

Respondents who comment on enforcement say that the level of enforcement on the refuge needs to increase. Some respondents suggest that implementation of some programs be delayed until adequate enforcement is in place. Others recommend developing a contingency plan in case proposed enforcement levels are not effective. An additional suggestion offered by some people is that the FWS have a backup force in place of either volunteers and/or community officers.

The key areas identified by respondents as needing increased policing efforts are off-highway vehicle trespass, poaching, dumping, trespass, and vandalism. As a typical respondent writes, "Preventing illegal use by ATVs is a major enforcement challenge for properties with large borders surrounded by suburban landscapes and with many potential entry points."

Wild and Scenic Rivers

The one concern regarding wild and scenic river designation expressed by several respondents is that hunting is incompatible with this designation and should be prohibited within these areas.

Priority Public Uses

Analysis of Existing Conditions and Need for Further Analysis

Several respondents question CCP visitor estimates and request better calculations, one respondent suggesting that based on personal experience the estimate of 70,000 people per year visiting Oxbow is "wildly incorrect. It is probably more like 7,000."

Numerous respondents request that scientific analysis of wildlife populations take place prior to any hunting or trapping. One conservation organization suggests that the CCP be driven entirely by wildlife surveys: "We suggest three overarching management priorities when considering policies about public use activities: 1. Public uses allowed under the CCP should be based on the findings of wildlife inventory and habitat management step-down plans. Public use plans should be based on wildlife inventory and habitat management plans; 2. The Service should monitor and adjust allowed public uses based on impacts to wildlife and habitat during the drafting/revision of step-down plans; 3. Public use should be coordinated among partner organizations with land holdings in the vicinity of refuges."

Several respondents argue that ongoing monitoring will be critical to management of wildlife-dependent recreation, typically: "The proposed additional monitoring projects in Alternative B for all three refuges must include at least that level of detail about how the monitoring and evaluation will be carried out. For example: The CCP states on pages 2-29, 2-68, and 2-95 that the Visitor Services Plans, to be completed by 2007, for Assabet River, Great Meadows, and Oxbow Refuges would include a monitoring program to evaluate the intensity and potential impacts of all the wildlife-dependent public uses on the refuges. What data have you collected to date on this issue and what has your analysis of the results shown? What steps are now being taken or will be taken until 2007 when the monitoring program is in place to ensure that current management of wildlife-dependent uses is not having an adverse effect on the resources?"

General Management Direction

Respondents offer a number of suggestions for general management direction of the Refuge Complex relating to priority public uses, typically defining the extent to which they believe various recreational activities should be permitted. Many respondents, for example, argue that the refuge should be "open to the public," by which they typically mean members of the public who undertake non-motorized recreation such as picnicking and jogging. For many, this is their defining test of the value of the refuge and a natural consequence of it being public land, e.g., since we pay taxes we get to use it.

For a few respondents, general access to the refuge is part payback for the original government acquisition of the land. For many more, there is a significant level of anger at the prospect of restriction of passive uses, e.g., "[Great Meadows] has been used with great respect and affection by the local public for well over the thirty years that we've lived here. I

can't imagine what reason or right the Federal Government might think it has to interfere with that use."

Some respondents acknowledge the mission of the refuge, and couch their suggestions in terms of "wildlife-dependent uses." These respondents suggest that jogging, dog-walking, picnicking, and bicycling are dependent on wildlife.

Many other respondents functionally argue that the purpose of the refuge should be redefined, making other arguments for permitting non-motorized recreation. For example, although few respondents articulate the thought as clearly and plainly, many implicitly advanced an argument in consonance with this comment: "The following suggestions are based upon the assumption that the primary purpose of the refuge is to preserve native species and habitat, but that other compatible uses are acceptable if they support and do not significantly interfere with the primary use."

Other respondents implicitly or explicitly question the priority attached to those activities defined as wildlife-dependent, e.g., "The boundary between wildlife-dependent and non-wildlife dependent activities is not always clear. The more important distinction, in our view, is between outdoor activities that have an adverse effect on the health and diversity of populations of natural organisms, and those that have little or no such impact."

Related to the assertion that only harmful public uses should be restricted, one respondent suggests that permitting only harmless uses would mean "hiking, skiing, snowshoeing, and not much else." A significant number of respondents asserted that off-highway vehicle use—legal and illegal—results in harm, and should be prohibited.

Some respondents offer support for the general direction of the FWS preferred alternative or general confidence in the agency's ability to sort things out. Some respondents ask the agency to monitor use and make appropriate judgments down the line, saying that the agency should continually evaluate relationship between recreational uses, ensure that all legal uses receive fair consideration and access, and minimize conflict.

Refuge Access

Again, many respondents argue for "access" to the Refuge Complex, by which they usually mean easy entrance for non-motorized recreation. While some respondents assert that certain specific activities (dog-walking, jogging, etc.) may negatively impact the refuge, most argue that non-motorized uses are harmless.

Regarding infrastructure, some respondents request that the FWS eliminate the maximum number of trails and roads to protect wildlife. Some respondents assert that off-trail access should be by permit only. One respondent asks that access be limited where it may impact state-listed rare species, such as Blanding's turtles, and argues that the FWS should survey for rare reptiles and amphibians before opening areas or new infrastructure for recreation access.

According to one respondent, "It would be nice if one long trail could be paved for handicapped people in wheelchairs."

Respondents provide many suggestions for specific access points and trails they would like to see developed.

Fees

A considerable number of respondents support fees for use of the Refuge Complex. As one respondent said at a public meeting, "They are great areas; I enjoy walking them a lot. I'd be happy to give somebody twenty bucks tonight to walk in them the rest of the year." Some of those who support user fees hinge continued support on clear and appropriate local application of funds, or on fee levels remaining stable.

A considerable number of respondents also oppose user fees at the refuge. Some respondents oppose fees based on their perception that the FWS is effectively double-dipping; quote one respondent, "We've already paid through taxes."

Respondents oppose user fees for a number of other reasons, arguing variously that fees will deter use (especially by low-income individuals) or alienate local residents and collaborators. Some perceive fees as a barrier, e.g.: "I am very much opposed to the plans for Great Meadows. This land has been use and enjoyed for many years, and I cannot fathom that access may be impeded by restricted hours and fees. The community benefits greatly from a refuge that is easily and freely accessible to all." "It belongs to all of us," another respondent writes, "not the few who are able to pay admission costs." A number of respondents argue that fees change the nature of a recreational experience, e.g., "It destroys the soul of the experience."

With regard to both opposition to fees and concern about the proposed fee schedule, it is worth noting that a number of respondents appear unaware of or uninterested in the possibility of purchasing an annual pass instead of paying upon each entrance to the park. For some respondents, then, fees may appear deceptively exorbitant.

With regard to fee schedules, several suggestions are advanced. Several respondents propose that local residents be exempted from fees. Some respondents suggest that volunteers receive free passes. A number of respondents suggest that hunting fees be higher than other entrance fees. Some respondents complain that a car full of hunters (for example) would be charged less for entrance than a family of bicyclists, and argue that non-motorized arrivals are less intrusive and solve parking problems, and should be admitted for lower charges than motor vehicles. One respondent suggests charging a parking fee, rather than an entrance fee.

Several respondents request clarification of fee schedules, in one case asking whether there are any fee differences between Alternatives B and C, and in another asking whether a $15 annual duck stamp wouldn't obviate the need to pay $20 for an annual permit.

Respondents also offer suggestions and concerns regarding the mechanics of fee collection and enforcement. A number of respondents argue that enforcement will be impractical and expensive, arguing that self-service doesn't work and that all refuge entrances will have to be staffed. Likewise, a number of respondents question whether entrance gates will work in a refuge with as many porous boundaries between local residences and conservation land as the refuge has. Several respondents ask whether fee income will be outweighed by financial and goodwill costs, and ask the FWS to provide a detailed analysis of costs and benefits.

Hunting

Hunting was the issue most frequently addressed in comments on the EMNWR CCP. The hunting issue most frequently raised by respondents was safety—many residents and recreationists fear that hunting will put them in danger. These responses merit close scrutiny, which follows in a section on public safety. However, many other issues were raised vis-à-vis hunting, and they will be discussed here.

Hunting advocates

Although lesser in number than those opposed to hunting, a number of both area residents and others voiced support for hunting on the Refuge. Some respondents assert that the purpose of refuges is conservation—not preservation—and that hunting should be allowed on all wildlife refuges. Others argue that hunting is plainly a wildlife-dependent activity, and one with important cultural and educational values. One respondent writes, "Hunting should also be recognized and allowed as a legitimate wildlife-dependent recreational activity. Pursuing wild game for sport and table fare is an American tradition as old as our country itself. Family bonds are forged and strengthened as parents pass on to their children valuable lessons in conservation and outdoor ethics. Hunting is a total wildlife-dependent experience that fosters an intimate knowledge of game and habitat and teaches a wide variety of wilderness skills."

Other respondents argue that sportsmen and women have "been the primary source of funding" for many conservation efforts, provide money to FWS, and therefore deserve entry to the refuge complex. Some respondents assert that hunters have been losing territory to development in northeast Massachusetts for decades, and argue that the refuge complex should, in fairness, and to relieve hunting pressure on other areas, be available.

Addressing the issue of displacement, several respondents indicate that hunting does not impact other recreationists. As a typical respondent states, "If you're worried about compatibility issues on the river as to being able to share, I hunt the Sudbury River, and people go by in their kayaks, I don't shoot when they're paddling by. I wave to them. They don't wave back, but I wave to them. I'm sitting there with my dog just, you know, letting them go on by."

Some hunting advocates also seek to allay safety concerns, arguing that hunting is an extremely safe sport. "Some local people have concerns about the opening of these areas to hunting. It is important to inform the public of the safeguards, rules and restrictions that will be associated with the harvest of resident wildlife. . . . If practiced safely hunting is no more dangerous than many other daily activities."

Some respondents (hunters and non-hunters alike) suggest that the Refuge permit bow hunting only, .e.g., "Once the abutters have an understanding of how close one must be to their quarry to execute a lethal shot, they will also understand that before a shot is made, and there is no question about what it is the archer is taking aim at. So there will be no mistaking a human or household pet for a deer. . . . It is not some beer-guzzling bubba sitting in wait for the first thing that moves but rather responsible people who have been through state-mandated training in the sport of bow hunting and who are dedicated to the sport who wish

every hunt to be a safe incident free experience for themselves and anybody they share the woods with."

Respondents also offer suggestions for ensuring safe hunts, such as banning buckshot and limiting magazine capacity. Some respondents suggest using testing, expense, and the willingness of hunters to assist with Refuge goals to ensure that only a safe and ethical subset of hunters have access to the Refuge.

Advocates of hunting also claim that hunting provides effective population control for nuisance species, arguing that waterfowl befoul water and recreation areas, and that deer cause traffic accidents, browse crops and ornamentals, and carry lyme disease-infected ticks.

Hunters also assert that their activities are humane, asserting that overpopulation will be addressed either through lingering, painful deaths by starvation or disease, or through quick and painless execution.

Some respondents support hunting but are concerned that access to Oxbow may be being increased too much, and ask that use be monitored and adjusted as necessary. Some respondents ask the agency to limit expansion to what can be handled by existing enforcement capability. Some respondents ask that waterfowl hunting at Oxbow include "the marshes and potholes," as well as Hop Brook near the train tracks. One respondent urges that there be no limits on waterfowling.

One respondent suggests that pheasant stocking continue at Oxbow, but not be expanded to Assabet.

Opposition to hunting

Opposition to hunting at the EMNWR is intense and widespread, at least within the subset of individuals who provided comment on the CCP. When respondents differentiate between game species, opposition to hunting turkey and grouse is common, but support for a limited deer hunt is more common. Leaving aside public safety, and the associated question of displacement, comments which question the wisdom of permitting (or expanding existing) fall into four broad categories: requests for additional analysis; concern over impacts; moral outrage; and concerns about iniquitous treatment of recreationists.

Additional Analysis

Some respondents don't plainly oppose hunting, but ask for additional analysis to justify and focus hunting. For example, one respondent says, "I am not in favor of hunting in that area unless it is required to control species that have no natural means of control, and justified by appropriate studies." Some respondents suggest that hunting not be regarded as recreation, but as wildlife population management, and that therefore it should be utilized only where comprehensive biological surveys and analysis indicate it would be of value for biodiversity or habitat protection. These respondents argue that only species with real overpopulations should be hunted (and ask for hard evidence, rather than anecdotes of browsed ornamentals), excluding species—such as woodcocks—that appear to be in decline. Some respondents question whether scientific analysis will indicate that hunting in such a limited area will have real impacts on area populations.

Some respondents assert that the CCP inadequately analyzes the impact of hunting. Respondents request more data on the cost of ministering to hunters, on impacts on public safety, habitat, and species, and on methods of implementation. Some respondents ask the FWS to evaluate the economic impacts of hunting, positing that displacement of other recreationists' results in negative impacts. Respondents ask for boundary clarifications and improved maps of available hunting areas. Respondents ask whether the agency has assessed its liability for hunting accidents.

Connected with the sense that analysis is inadequate is the argument that the "cure" is inappropriate to the problem. Respondents suggest that beavers be controlled through non-lethal means, which they argue have been proven more effective than trapping.

Impacts

Several respondents oppose hunting based on perceived impacts to other resources. As one respondent writes, "A great number of migratory birds rely on this sanctuary for breeding, as do many amphibians, reptiles, fish and mammals. Loud noise such as gun shot is known to interfere with breeding. Such interference seems in direct conflict with the intent of this land as sanctuary." Numerous area residents complain that the sound of gun shots is aesthetically disturbing as well as frightening.

Several respondents express concern about the impact of lead shot on wildlife and water quality. Several respondents argue that hunting off-trail with or without dogs will cause damage, and suggest that off-trail use be as limited for hunters as it is for other recreationists. Several respondents argue that many migratory birds are in decline, and ask that none be hunted.

Moral objections

Comments from both area residents and apparent respondents to a campaign by animal rights organizations indicate revulsion at the idea of hunting, particularly on a national wildlife refuge. For example: "Of all the violent, destructive activities in the world, hunting is right up at the top of the list. I am really disgusted at these proposed changes, as is the rest of my family. We live very close to Great Meadows, and I'm sure that the last thing we want to hear in the middle of a peaceful Saturday afternoon is gunfire ripping though the air followed by the squeal of a helpless animal gasping its last breath." Or: "Hunting, especially trapping, is an unnecessary and cruel attack on nature's innocent creatures. To permit people to entertain themselves by cruelly destroying the lives of other beings is unconscionable. Hatred, selfishness, and violence tear the world we live in today. Encouraging people to hunt and to kill does nothing to heal our wounds and move us toward a better world."

Respondents argue that hunting should not be permitted, because, they allege: it benefits a small constituency; fees for sportsmen and women are a minor part of overall conservation funding; hunters kill two animals for each they harvest, leaving the others to die suffering, lingering deaths; hunters present a danger to non-game species; in terms of population control, predators better select prey; hunting stresses wildlife.

Respondents are particularly angered by the idea of hunting on a refuge, which they perceive to be directly in conflict with the purpose and definition of a refuge. One typical respondent describes shooting wildlife on a wildlife refuge as "oxymoronic."

Iniquity

A strong sentiment running through the comments is a sense that there is something inconsistent, unfair, and hypocritical about permitting hunting on the EMNWR while prohibiting activities such as dog-walking, jogging, and picnicking on the basis of their wildlife impacts. As one respondent writes, "It makes absolutely no sense to me that hunting will be allowed in the refuge, but dogs on leashes and bike riding will not be allowed. How in the world are dogs on leashes and people on bicycles considered dangerous to wildlife, yet people with guns are okay?" Or as a conservation group writes, "Inconsistent or arbitrary management of public use could lead to confusion and resentment. Why could someone who is hunting grouse have a dog (unleashed!) whereas non-hunters must leave their canine friends at home? Can a birdwatcher take along a sandwich, or is that considered picnicking? If the pace of a jogger spooks wildlife, then why can someone cross-country ski?"

Many respondents assert that quiet recreation opportunities are rare, but that adequate hunting is already available.

Hunting and Public Safety

Many respondents argue that expanded hunting will threaten the safety of area residents and other recreationists. It is easiest to consider these comments in two categories: threats to people, and displacement of recreationists.

Threats to people

Many respondents, including many local residents, argue that a) they will feel unsafe if hunting is permitted on the Refuge, and b) that people or animals will be injured or killed by friendly fire. A typical comment: "I was brought up learning how to handle a gun, including shotguns, and remember going deer hunting with my father in Lincoln, Lexington and other towns west of Boston—albeit over 50 years ago. . . . Without prejudice one way or the other about the justification for hunting, I think the CCP fails to address the important issue of public safety and the dangers resulting to adjacent schools, roadways and homes in the Refuge area. Clearly, MetroWest is already too overbuilt to allow for the extended hunting proposed in the CCP." Or: "I do not want to be shot hanging clothes in my back yard."

To protect visitors to other conservation lands, some respondents suggest that hunters be prohibited from using public access points to other lands (such as Foss Farm and Greenough Conservation lands). Local abutters and area residents are particularly concerned about stray or mistargeted bullets, and raise concerns regarding a number of specific sites such as the Maynard public school campus and the southern portion of the Sudbury unit.

One respondent raises concerns regarding the resources local law enforcement will expend as a result of increased hunting: "As the Chief of Police in the Town of Billerica I am concerned about proposed hunting on and around the Concord River. This has been a safety and noise concern for residents of west Billerica for many years. I feel that this proposed change will increase these problems. Please take into consideration that this end of the refuge is a

populated area and hunting can pose safety risks. Additionally this will cause an influx of Police calls to the area to determine if hunters are on private property or refuge land. Does the plan have any contingency to compensate the town for this added use of resources?"

Displacement

Many respondents aver that they will be unable to use the Refuge during hunting season. One respondent asks that the FWS "Expand the Compatibility Determination analysis to include an assessment of recreational compatibility. This should include a determination that the conditions that motivated the past Refuge Manager to ban hunting have been alleviated." Respondents argue that creating an exclusive use for significant portions of the year is unfair and unwise. Some respondents express significant concern for area recreationists over unmarked and porous boundaries between the Refuge, conservation land, and residences, particularly where hunters might go off-trail. A typical respondent writes, "I am also opposed to hunting, not for moral reasons, but for safety reasons. I and my dogs were the target of a hunter at Great Meadows several years ago. I had to hit the ground and crawl behind a tree for safety. He didn't see me, though when he heard me, he took off in a hurry."

Some respondents complain that hunting season occupies optimal use times for the Refuge, one respondent stating that no one uses refuges in summer because "the deer flies will kill you." Several respondents think along similar lines, suggesting reduced hunting opportunities to permit other recreation: "Maybe hunting could be limited to a few weekends per season," writes one, while another suggests a couple days of hunting per week. Another respondent suggests things would be better "if you had one or two hunting days where experienced hunters signed up to do a 'cull' if you could actually get them to kill sick, old and slow individuals instead of the healthiest, biggest and most impressive animals—and those days be highly publicized so innocent people wouldn't be hurt."

Some respondents suggest that the only safe course of action is to close the Refuge to other uses during hunting season.

To alleviate these concerns, some respondents argue that hunting should only be done by professionals paid by the refuge for wildlife management: "If the refuge needs to use deadly force to carry out the mission, have that applied by trained professionals and not by anyone with ten bucks and a shotgun."

Several respondents mention the need to educate both hunters and area residents on the schedule and placement of legal hunting. Several respondents talk about the need to increase law enforcement to deal with increased hunting, and some assert that the Refuge's record of successful interdiction of motorized trespass and vandalism indicates a current inability to enforce laws, and little confidence that hunting can be safely policed.

Dogs and Public Safety

A number of respondents offer intensely felt comments advocating continued use of dogs on the refuge as a matter of personal safety. These respondents, all women, state that prohibiting dogs effectively prohibits their use of the refuge, e.g., "I am a woman and very aware that when I am in the woods—I am an easy prey object for defective human types. I would never walk alone in the woods without my dog—a 120 pound dog at my side is a huge deterrent to

even trying something. I have been approached in the past by questionable behavior and my dog at that time did place himself between me and the man creeping up behind me. The man turned and left. By banning dogs on-leashes at Great Meadows you effectively ban all women."

Fishing

With the exception of the occasional "let us fish anywhere we want," most fishing comments are restricted to Puffer Pond on the Assabet River. There is considerable support for fishing on Puffer Pond, and for the proposal to do so, and some respondents argue that anglers infrequently transport invasives.

There are also a number of respondents who request that fishing be prohibited on Puffer Pond. Respondents argue that anglers will disturb nesting birds, erode the shore, trample vegetation, bring in invasives, and drag boats through the refuge. As one respondent writes, "Little consideration has been given to the effect [fishing] would have upon Puffer Pond's habitat. The shoreline risking areas would gradually be expanded by use, destroying additional shoreline habitat and pond plants. Trash that is left behind such as beverage containers, fishing gear wrappers, tangled fish line in trees, on the ground and in the water, are a danger to birds, waterfowl, and other wildlife. How a shoreline fishing area would be made handicapped accessible is not discussed. Catch and release is an ideal fishing concept. However, it can prove to be fatal to many fish due to hook swallowing and extraction. Enforcement of catch and release will be difficult. Due to the small size of the pond, the popularity of fishing, and the high density of the area, the pond would soon be in danger of being greatly depleted. This rapid removal of fish would affect other wildlife populations that depend upon the pond for food. These would include the colony of great blue herons currently residing in the refuge near the pond, raccoon, and other water and fish dependent animals."

Respondents concerned about impacts to Puffer Pond, but not categorically opposed to fishing, suggest very limited shoreline access to the Pond, to reduce impacts, and in one case a prohibition on the use of treble hooks. One respondent offers extensive recommendations for minimizing the threat of invasives.

Several respondents ask how the agency intends to adequately enforce restrictions and monitor impacts at Puffer Pond.

Environmental Education

A large majority of respondents who chose to address this section of the CCP support the environmental efforts and facilities proposed in Alternative B, advocating more environmental education for people of all ages. Several respondents encourage completion of the proposed Sudbury River interpretive canoe trail. Several respondents encourage the FWS to think bigger, and develop its educational plan in concert with other regional entities and efforts, such as a Sudbury-Concord River valley regional conservation study and education effort. One respondent urges that "a full-scale information/education center is included as part of the future considerations for the Oxbow. . . . The Oxbow is also significant because it

offers the additional opportunity for linkages with other state, private and town owned lands. And it is also situated in the center of the proposed Freedom's Way National Heritage Area." One respondent urges the FWS to use the refuge principally for biological studies.

With regard to facilities, one respondent is "very interested in the potential development of a visitor center in the area of Great Meadows NWR. We would like to explore any opportunities to increase the public understanding of the Sudbury, Assabet River and Concord Wild and Scenic Rivers within the educational materials and displays presented at the visitor center." One respondent urges the FWS to continue historical tours: "These have been very popular and have provided a way by which some of Maynard's older residents can view the refuge. Several such tours a year would provide access to history and wildlife through use of a motorized van or bus."

One organization requests clarification on facilities development "The proposed management of public outreach is unclear. The only designated public outreach position is slotted for Great Meadows. Does this position support all three refuges, or Great Meadows, or the complex as a whole? Does this individual coordinate volunteer efforts and recruit volunteers for all three refuges, or Great Meadows, or the complex as a whole?"

Some respondents complain that recreational restrictions undermine opportunities for education at the refuge, and urge that leashed dogs and off-trail nature study and photography be permitted. Several respondents urge the FWS to close some areas to hunting to permit educational tours in spring and fall.

Recreation

Due to the refuge's proximity to heavily populated areas, and an already existing recreational trail system, accessing the refuge for recreation is a major concern of many respondents. Some respondents even see the refuge as a sort of town park. Many local residents that responded did not expect restrictions on recreation when they supported FWS's offer to buy the property. Others support the concept that wildlife sanctuary should be the priority, and use limitations should be imposed.

Some respondents see access for recreation at the refuge as a means to an end: "Through controlled access to refuges you can create and sustain a community of citizens who will not only care for the refuges but also support the Fish and Wildlife Service in its struggle to maintain them."

Some respondents want the refuge to be used for quiet sports only, and ask that motors be prohibited to reduce noise, air and water pollution, erosion of soil, and to increase safety. As one respondent states, "I urge you to support making the refuge into a place where passive recreation can take place. By that I mean prohibiting motorized vehicles and hunting. The land is a treasure for hikers, bikers, runners, birdwatchers, nature lovers and, as such, should be preserved for this and future generations."

Snowmobiling

Snowmobilers describe themselves as law-abiding recreationists that are respectful of others and wildlife. One local snowmobile club would like to establish a trail through the refuge, maintained by the club, for the club's enjoyment. This club goes on to point out that snowmobiling will not harm the terrain or wildlife because snowmobiling usually occurs from the beginning of January to the beginning of April (at the latest) and only when there is a minimum of four inches of snow. Further, snowmobiling is already governed by Massachusetts laws requiring, among other things, that snowmobiles stay on the trail. Snowmobiling, the club concludes, is a traditional use in the area and ask the FWS to let snowmobilers use traditional trails.

Jogging

Joggers view the refuge as a safe, peaceful place to pursue their activity, and are confused as to why jogging would be banned. One respondent states that the refuge ". . . is a beautiful place to jog, particularly because it is one of the few off-road places with no early morning traffic. It would be shame if joggers were not allowed to use the paths of the Wildlife refuge." Another respondent asserts that, "The joggers I've seen are respectful of walkers, seems inconsistent when hiking, snowshoeing, and cross-country skiing are allowed." Another respondent writes: "If anyone ever asks, I guess I'll just tell folks, 'Oh no, I'm not running, I'm just hiking real fast.'"

Picnicking

Picnicking is viewed by many respondents as a harmless past time that allows people to enjoy the refuge's beauty. As one respondent puts it, "Is this really such a huge problem? On my daily walks I never see any trash along the trails. . . . What is so bad about taking a family, a lunch basket, and enjoying a couple of hours surrounded by nature?" These respondents ask the FWS to allow picnicking within the refuge.

Bicycling

Similar to jogging, many respondents assert that the refuge offers a safe, traffic-free environment for bicycling. These respondents also point out that bicycling is already an important component of the surrounding towns, and that many local residents have moved into the area because of its extensive town trail system. By not allowing bicycling in the refuge, FWS will be creating a gap in the local trail systems. For example, the nearby areas of the Stow Town Forest, the Sudbury State Forest, the Memorial Forest Reservation, and Desert Natural Area allow bicyclists on the trails. The addition of the refuge to this significant resource would yield excellent opportunities for exercise and enjoyment of the natural setting, by allowing cyclists to connect with other available areas. Therefore, respondents ask that the refuge acknowledge the local trail systems' benefits by allowing responsible cyclists to use the refuge's roads. Some cyclists are willing to be flexible as to when and where they can pursue their sport. One respondent suggests FWS provide signage to indicate allowed routes and speed limits to help restrict bicycling that may conflict with wildlife activities. Another proposes that the FWS set aside periods during the day when bicycling would be permitted. Others suggest allowing cycling on paved roads only.

Other respondents aren't as sympathetic to cyclists, and would like to see bicycles kept off the refuge. One respondent asserts that riding a bike is a poor way to observe wildlife, and that if the refuge allows cycling, many cyclists would speed through or venture off designated paths.

Horseback Riding

As with the cyclists, equestrians are concerned that not allowing horseback riding in the refuge will compromise access to other conservation/state/local forest trails immediately surrounding the refuge, such as the Stow Town Forest, Sudbury State Forest, Marlboro State Forest, Sudbury Conservation Land, and the Desert Memorial Forest. The refuge is located directly in the middle these properties, and presently corridors allow horseback riders to travel from one conservation land to another. Further, this group asserts that horseback riding has not impacted other uses in the aforementioned areas. These trail riders ask that the refuge be open to horseback riding, and that consideration be given to an access trail so riders may traverse the refuge to access other conservation areas. Another respondent asks FWS to work with various trail riding and breed organizations in Massachusetts, to establish a horseback riding plan that serves the needs of wildlife and those who enjoy nature from horseback. Further, the Bay State Trail Riders offer to help with the maintenance of any connector trails with volunteer work days and funds if necessary.

Some respondents point out the economic benefits of horseback riding, stating that equine activities are engaged in by a large number of Massachusetts citizens and also make a significant contribution to the Massachusetts economy. For example, they assert that equine agriculture provides over $200 million per year in direct spending into the Massachusetts economy, over 5,000 jobs and more than $13.2 million in state and local tax revenues. Limiting horseback riding would harm the economy.

Equestrians state that they oppose expansion of the refuge's boundaries as long as it limits horseback riding.

Dog-Walking

Many respondents assert that given the popularity and demand for areas to walk dogs, and the fact that parts of the refuge have been used responsibly for decades by dog-walkers; FWS should make part of the refuge available for this pastime. These dog walking enthusiasts request that leashed dog-walking be allowed on refuge trails in appropriate areas, and that strict fines are in place for anyone releasing a dog or failing to pick up after their animal. Others are willing to allow an exclusion of dogs during the most sensitive times, when wildlife surveys identify an impact on nesting birds or other animal life. Many of these respondents view dog-walking as meditative and a way of connecting to the natural beauty of the earth, something that is consistent with refuge goals. These respondents assert that without substantial evidence that dog-walkers are threatening the integrity of the refuge it is unjust and an act of discrimination to prohibit dog-walking. On the other hand, one respondent would like to see dogs banned from the refuge, stating that many dog owners don't obey leash rules to the detriment of wildlife, and further, even on a leash dogs frighten animals.

Birdwatching

Birdwatchers and nature photographers are concerned that they will be confined strictly to trails when observing wildlife, while hunters would not. If hunters are allowed off trail, they assert, birders should be allowed off trail as well.

Trapping

Some respondents ask that the Refuge be open to beaver and muskrat trapping, asserting that modern traps are instant and humane, and arguing that small game threatens children, pets, and livestock, and that beavers "cause extensive property damage."

Some respondents ask whether and under what circumstances which furbearers could be trapped, and what constitutes an invasive species and appropriate control methods.
Some respondents oppose trapping on the grounds that it is inhumane; other respondents perceive trapping as ham-fisted interference in natural systems that function best on their own.

Socioeconomic Concerns

Several respondents applaud Alternative B for helping to make Maynard a "destination." One respondent requests permission to graze in the Oxbow unit, and one requests continued cooperative farming.

Several area residents request development of an "abutter policy," without clearly articulating what the components of such a policy would be.

Several respondents urge consideration of impacts to area parking, specifically at Monsen Road at Great Meadows, and at the east gate of Assabet River off Old Marlborough Road. Some respondents are concerned about refuse at entry points.

Appendix A
Coding Structure and Demographic Codes

Eastern Massachusetts National Wildlife Refuge Complex Draft CCP/EA

Header Information

Coders will identify organization type, number of signatures, response type and delivery type on all letters by filling in the proper box. Use **CIC** (Common Interest Class) field only if this information is requested by the Administration. Fill in additional fields when necessary.

Header Order: MID, OT, S, and **RT**, and **DT** fields are required. **IA, UT, LG, F, CIC, RI,** and **CE** fields are optional fields and used only where necessary. The **TS** (Total Signatures) field will tally automatically in Oracle. A stamp containing these fields will be placed on the working copy.

MID	**OT**	**S**	**RT**	**DT**	**IA**	**UT**	**LG**	**F**	**CIC**	**RI**	**CE**	**TS**

Mail Identification (MID)

The Mail Identification number is a unique respondent number assigned in the CAET Oracle Program. The Oracle form contains mailing information needed to create mailing labels and obtain project specific demographic information about a respondent.

Organization Types (OT)

The Organization Type code identifies a specific type of organization, association, government agency, elected official, or individual.

Government Agencies and Elected Officials

F Federal Agency
N International Government/International Government Association
S State Government Agency/Elected Official/Association
C County Government Agency/Elected Official /Association
T Town/City Government Agency/Elected Official/Association
Q Tribal Government/Elected Official/Tribal Member/Association
E Government Employees Organizations/Unions

FW Fish Wildlife Service Employee
XX Regional/other governmental agency (multi-jurisdictional)

Business and Industry

A Agriculture Industry or Associations (Farm Bureaus, Animal Feeding)
B Business (my/our, Chamber of Commerce)
G Range/Grazing Orgs and Permittees
HT Hunting/trapping Industry or Org
M Mining Industry/Assn (locatable)
O Energy Industry (Oil, Gas, Coal, Pipeline)
U Utility Group or Org (water, electrical, gas)
L Timber or Wood Products Industry/Assn

Other Organizations

AD Academic
AR Animal Rights
CH Church/Religious Groups
D Placed Based Groups (Multi-issue, focused on a specific region—i.e., QLG)
H Consultants/legal representatives
J Civic Organizations (Kiwanis, Elks, Community Councils)
K Special Use Permittees (Outfitters, Concessions, Ski Areas)
P Preservation/Conservation Organization
PA Professional Association/Society
QQ Tribal Non-Governmental Organization/Member
RB Mechanized Recreation (bicycling)
RC Recreational/Conservation (Trout Unlimited, Elk Foundation, Ducks Unlimited)
RM Recreational - Motorized
RN Recreational - Non-Motorized (hiking, biking, horseback riding)
SC All Schools
X Conservation Districts
Y Other (Organization with an indecipherable focus—i.e., Ice Cream Socialist Party)
Z Multiple Use/Wise Use

Unaffiliated

I Unaffiliated Individual or Unidentifiable Respondent

Number of Signatures (S)

The number of signatures is the total count of names associated with a mail identification (Mail ID) number. The procedure for determining the number of signatures for a Mail ID number is consistent across all response types. In other words, letters, forms, and other types will be treated the same for determining the number of signatures. Each individual name associated with one Mail ID is counted as one signature. When a Mail ID has an incomplete name associated with it, such as an anonymous letter or an email address, it is counted as one signature. Mr. and Mrs. X are counted as two signatures.

Response Type (RT)

The Response Type identifies the specific format of correspondence.

1 Letter
2 Form or Letter Generator
3 Resolution
4 Action Alert
5 Transcript (dictated Audio, Video, Telephone response)

Delivery Types and Descriptions (DT)

The Delivery Type identifies the method of delivery for the correspondence.

E Email
F Fax
H Hand-delivered/oral testimony (personally delivered)
M Mail or commercial carrier (includes video, audio, letter format)
T Telephone
U Unknown

User Type (UT)

The User Type identifies the purpose for which an individual, organization, or agency uses public lands/refuge.

A Area Residents
B Businesses and Services
D Dog Walkers
E Environmental Educational
K Bikers
F Anglers
H Hikers
P Photographers
W Non-motorized Recreation
M Motorized Recreation
S Horseback Riding
T Hunters
X Non-identifiable

Early Attention (IA)

Early Attention codes are applied only to those documents requiring an early response from the ID team. The Early Attention codes are listed in order of priority. If more than one code applies to a single document, the code with the highest priority is attached.

1 **Threat of harm** – Any response that threatens physical harm to administration, agency, or project personnel.

2 **Notice of appeal or litigation** – Any response that describes the respondents' intent to appeal an action or bring legal suit against the agency.

3 **Freedom of Information Act (FOIA) requests** – Any response that officially requests information and documentation under the FOIA.

4 **Provides proposals for new alternatives** – Any response that suggests a new alternative to the proposed action. These do not include critiques of alternatives or partial changes of existing alternatives.

5 **Requires detailed review** – Any response that requires detailed review. These responses may include detailed scientific or technical analysis, or significant enclosures.

5A **Provides extensive technical edits** – includes extensive use of lined out text, suggestions to delete text, and/or replace text.

5M **Provides maps** – Any response that includes map enclosures.

6 **Government entities** – Any response from an elected official, writing in his/her official capacity, representing a Federal, State, county, or municipal government. Also includes official correspondence from any government agency.

6A **Requests for cooperating agency status from a government entity**.

7 **Public hearing** – Any response that requests a public hearing.

Information Request (RI)

Information Request codes are applied only to those documents with specific requests for information pertaining to the proposal.

A Mailing List Only/Nothing to Code
B Request to be Removed from the Mailing List
C Request for Copy of Federal Register Notice
D General Request for Other Information
E Request for Confirmation of Receipt of Letter

Comment Extension Request (CE)

Comment Extension codes are used when a respondent has a specific request for extending the comment period.

0 Request to Extend the Comment Period

Eastern Massachusetts National Wildlife Refuge Complex Draft CCP/EA

The coding structure is a topical outline with alpha and numeric codes attached. It is a tool to identify public comments and sort them into recognizable topic categories. Once comments are assigned codes, they are then entered into a database from which they can be reported and sorted in any combination needed for analysis.

The coding structure is organized into required fields called subject and category codes. Subject codes are five-character alpha codes that represent broad themes associated with a project. Category codes are five-digit numeric codes that define specific subtopics within each subject code, and they are generally arranged from the general to specific with subcategories nested within categories.

PLANN (Subject Code) - Introduction - Chapter 1 and Coordination with Others - Chapter 5

10000 (Category Code) Planning Process and Policy

- 10100 Timeframes for planning/Length of comment period *(adequacy of, timing)*
- 10200 Public Involvement *(General strategies, methods & techniques, collaborative efforts, pre-EIS/CCP consultation)*
- 10300 Scoping *(General comments, planning before the EIS)*
- 10400 Relationship to other planning processes *(Conflicts with other area projects, general planning)*
- 10500 Statutory Authority *(Compliance with laws and regulations; general references to/ violations of NEPA, APA, NFMA, Planning Regs. For resource-specific regulations, code to resource)*
- 10600 Science/Resource-Based Decision-Making *(Use of science in Decisionmaking; general references to use of science and scientific documents)*
- 10700 Budgetary Ramifications *(References to the cost of implementing the proposed rule, project funding)*
- 10800 Agency Organization, Structure and Staffing *(General comments not specific to project, includes trust and integrity issues)*
  - 10810 Trust and Integrity
- 10900 Coordination & Consultation *(Interagency, State, Private, Tribal)*
- 11100 Clarity/organization of planning documents
- 11200 Technical and Editorial Comments

12000 **Purpose and Need** *(General references to the purpose and need of the CCP/EA and needs for further analysis; if specific, code to the resource).*

- 12100 Project Area *(Scope of project)*
- 12200 Proposed Action/ Decision to be Made *(What it should/should not include)*

12300 Range of Issues Identified through Public Scoping *(General; Comments specific to resource areas go to AFFEC)*

12400 Issues and Concerns Considered Outside the Scope of This Analysis

12500 Permits and Agency Approvals Required

12600 Guiding Policy for Public Lands *(General land management philosophies)*

ALTER - Alternatives - Chapter 2

13000 Alternatives (Comments that simply vote, without rationale)

13100 Alternative A: Current Management *(General comments not specific to a resource; Assumptions made in the analysis)*

13200 Alternative B: Proposed Action

13300 Alternative C

13400 Formulating Alternatives *(Issues used, Design criteria, Development, etc.)*

13500 Features common to all Alternatives

13600 Features common to Action Alternatives only (B & C)

13700 Alternatives Considered But Not Given Detailed Study *(Same as eliminated alternatives)*

13800 Range/Comparison of Alternatives *(General comments, adequacy of range; I like A &C better than B)*

13900 New Alternatives *(Support for or recommendation for a new one)*

13910 Alternative Matrices *(Including Map comments and references)*

AFFEC - Affected Environment - Chapter 3, and Environmental Consequences - Chapter 4

14000 Physical, Biological, and Socio-Economic Resources (general Climate comments, extensive lists)

15000 Geology/Topography

15100 Analysis of Existing Conditions and Need for Further Analysis

15200 General Management Direction *(including other Management Impacts on this Resource)*

15300 Cumulative Impacts

15400 Mitigation and Monitoring

16000 Soils

16100 Analysis of Existing Conditions and Need for Further Analysis

16200 General Management Direction *(including other Management Impacts on this Resource)*

16300 Cumulative Impacts

16400 Mitigation and Monitoring

17000 Hydrology

17100 Analysis of Existing Conditions and Need for Further Analysis

17200 General Management Direction *(including other Management Impacts on this Resource)*

17300 Cumulative Impacts

17400 Mitigation and Monitoring

18000 Air Quality

18100 Analysis of Existing Conditions and Need for Further Analysis

18200 General Management Direction *(including other Management Impacts on this Resource)*

18300 Cumulative Impacts

18400 Mitigation and Monitoring

19000 Water Quality

19100 Analysis of Existing Conditions and Need for Further Analysis

19200 General Management Direction *(including other Management Impacts on this Resource)*

19300 Cumulative Impacts

19400 Mitigation and Monitoring

20000 Vegetation and Habitat Types

20100 Analysis of Existing Conditions and Need for Further Analysis

20200 General Management Direction *(including other Management Impacts on this Resource)*

20300 Forested and Shrub Dominated Wetlands

20400 Vernal Pools and Ponds

20500 Bordering Communities *(Uplands, Marshes, Swamps)*

20600 Invasive or Overabundant Species

20700 Cumulative Impacts

20800 Mitigation and Monitoring

21000 Wildlife and Fisheries

21100 Analysis of Existing Conditions and Need for Further Analysis (Fencing)

21200 General Management Direction *(including other Management Impacts on this Resource; general habitat comments.*

21300 Migratory Birds

21400 Mammals

21500 Reptiles and Amphibians

21600 Fisheries

21700 Invertebrates

21800 Cumulative Impacts

21900 Mitigation and Monitoring

22000 Cultural Resources and Special Designations (focus areas)

22100 Analysis of Existing Conditions and Need for Further Analysis

22200 General Management Direction *(including other Management Impacts on this Resource)*

22210 Land Acquisitions

22300 Refuge Buildings and Facilities

22400 Refuge Administration and Staffing

22410 Volunteers

22420 Enforcement

22500 Wild & Scenic River Plan / Designation

22600 Cumulative Impacts

22700 Mitigation and Monitoring

23000 Priority Public Uses

23100 Analysis of Existing Conditions and Need for Further Analysis

23200 General Management Direction *(including other Management Impacts on this Resource)*

23210 Access

23220 Fees

23230 Passes and Permits

23240 Visitor Safety

23241 Hunting

23242 Dog Walking

23300 Hunting *(If safety concern, code to 23241)*

23310 Big and Upland Game Hunting

23320 Migratory Bird Hunting

23400 Fishing

23500 Wildlife Observation and Photography

23600 Environmental Education and Interpretation

23610 Natural and Cultural History Tours

23620 Outreach for Public Awareness

23700 Cumulative Impacts

23800 Mitigation and Monitoring

24000 Recreation and Other Opportunities

24100 Analysis of Existing Conditions and Need for Further Analysis

24200 General Management Direction *(including other Management Impacts on this Resource)*

24300 Motorized Recreation
- 24310 Snowmobiling

24400 Non-Motorized Recreation
- 24410 Snowshoeing / X-Country Skiing
- 24420 Walking/Jogging
- 24430 Picnicking
- 24440 Biking
- 24450 Horseback Riding
- 24460 Dog-Walking, general *(if safety concern, code to 23242)*
- 24470 Bird Watching

24500 Cumulative Impacts

24600 Mitigation and Monitoring

25000 Socio-Economic Resources

25100 Analysis of Existing Conditions and Need for Further Analysis

25200 General Management Direction *(including other Management Impacts on this Resource)*

25300 Population and Demographic Conditions

25400 Schools

25500 Neighboring Communities
- 25510 Infrastructure *(Roads, Plazas, Utility Corridors, etc.)*
- 25520 Revenue Sharing

25600 Cumulative Impacts

25700 Mitigation and Monitoring

26000 Appendices *(General Comments and Technical/Editorial)*

ATTMT – Attachments

27000 [Attachment No., Title, Author's name]

Site Specific 1

The Site Specific 1 code is an up to four digit alpha/numeric comment specific code. For this project, the alpha-code is used to indicate which refuge the comment addresses.

A Assabet River NWR
G Great Meadows NWR
O Oxbow NWR
X Multiple NWRs/Null

Appendix B
Demographics

Demographic coding allows managers to form an overall picture of who is submitting comments, where they live, their general affiliation with various organizations or government agencies, and the manner in which they respond. The database can be used to isolate specific combinations of information about public comment. For example, a report can include public comment only from people in Massachusetts or a report can identify specific types of land users such as recreational groups, agricultural organizations, or businesses. Demographic coding allows managers to focus on specific areas of concern linked to respondent categories, geographic areas, and response types.

Although demographic information is captured and tracked, it is important to note that the consideration of public comment is not a vote-counting process. Every comment and suggestion has value, whether expressed by one or a thousand respondents. All input is considered, and the analysis team attempts to capture all relevant public concerns in the analysis process. The Content Analysis Team processed 1,907 responses. Because 28 responses are duplicates, the team entered 1,882 responses into the database representing 1,959 signatures, for the Draft CCP/EA.

In the tables displayed below, please note that demographic figures are given for number of responses, respondents, and signatures. For the purposes of this analysis, the following definitions apply: “response” refers to a discrete piece of correspondence; “respondent” refers to each individual or organization to whom a mail identification number is assigned (e.g., a single response may represent several organizations without one primary author); and “signature” simply refers to each individual who adds his or her name to a response, endorsing the view of the primary respondent(s).

Geographic Representation

Geographic representation is tracked for each response during the course of content analysis. Letters and emails were received from 49 of the United States, the District of Columbia, and one foreign country. The response format did not reveal geographic origin for 102 respondents.

Table C1 - Geographic Representation of Respondents by Country and State

Country	State	Number of Respondents	Number of Signatures
Costa Rica		1	1
United States	Alabama	9	9
	Alaska	2	2
	Arizona	22	22
	Arkansas	6	6

Country	State	Number of Respondents	Number of Signatures
	California	201	208
	Colorado	16	16
	Connecticut	19	19
	Delaware	1	1
	District of Columbia	4	6
	Florida	63	65
	Georgia	16	16
	Hawaii	4	4
	Idaho	2	2
	Illinois	45	45
	Indiana	16	16
	Iowa	3	3
	Kansas	10	10
	Kentucky	4	4
	Lousiana	7	7
	Maine	8	9
	Maryland	36	39
	Massachusetts	710	752
	Michigan	30	32
	Minnesota	21	21
	Mississippi	2	2
	Missouri	17	17
	Montana	2	2
	Nebraska	2	3
	Nevada	12	12
	New Hampshire	16	16
	New Jersey	35	38
	New Mexico	6	6
	New York	110	111
	North Carolina	28	29
	Ohio	30	31
	Oklahoma	6	6
	Oregon	14	14
	Pennsylvania	58	60
	Rhode Island	10	10
	South Carolina	13	14

Country	State	Number of Respondents	Number of Signatures
	South Dakota	1	1
	Tennessee	8	8
	Texas	68	69
	Utah	6	6
	Vermont	6	6
	Virginia	19	20
	Washington	29	29
	West Virginia	5	5
	Wisconsin	21	21
	Wyoming	2	2
	Unidentified	102	106
	Total	**1,884**	**1,959**

Organizational Affiliation

Responses were received from various organizations and unaffiliated individuals. Respondents include conservation organizations, wood products associations, as well as unaffiliated individuals and others. Organization types were tracked for each response.

Table C2 - Number of Respondents/Signatures by Organizational Affiliation

Organization Field	Organization Type	Number of Respondents	Number of Signatures
AR	Animal Rights	5	7
B	Business	1	1
D	Place-Based Group	6	6
F	Federal Agency/Elected Official	2	2
HT	Hunting/Trapping Organization	8	8
I	Unaffiliated Individual or Unidentifiable Respondent	1,820	1,885
J	Civic Organization	2	2
P	Preservation/Conservation Organization	14	14
RB	Recreational – Mechanized	1	1
RC	Recreational – Conservation Organization	2	2
RM	Recreational - Motorized	2	2
RN	Recreational – Non-motorized/Non-mechanized	2	2

Organization Field	Organization Type	Number of Respondents	Number of Signatures
S	State Government Agency	6	6
SC	Schools	1	1
T	Town/City Government Agency/Elected Official	12	20
Total		**1,884**	**1,959**

Response Type

Response types were tracked for each response received on the project. Responses were received as letters and public meeting transcripts.

Table C3 - Number of Responses/Signatures by Response Type

Response Type #	Response Type	Number of Responses	Number of Signatures
1	Letter	497	543
2	Form	1,334	1,365
5	Transcript	51	51
Total		**1,882**	**1,959**

Delivery Type

Delivery types were tracked for each response received on the project. Responses were received as email, fax, hand-delivered, standard mail, and one telephone call. Delivery type was not revealed for 11 responses.

Table C4 - Number of Responses/Signatures by Delivery Type

Delivery Type Code	Delivery Type	Number of Responses	Number of Signatures
E	Email	1,630	1,677
F	Fax	1	1
H	Hand-delivered	67	67
M	Mail or commercial carrier	172	202
T	Telephone	1	1
U	Unknown	11	11
Total		**1,882**	**1,959**

User Type

User type was tracked for each response received on the project. User types include anglers, bikers, area residents, dog walkers, photographers and others.

Table C5 - Number of Responses/Signatures by User Type

User Type Code	User Type	Number of Responses	Number of Signatures
A	Area Residents	202	220
B	Businesses and Services	1	2
D	Dog Walkers	14	15
E	Environmental Education	2	2
F	Anglers	2	2
H	Hikers	19	23
K	Bikers	7	7
M	Motorized Recreation	3	3
P	Photographers	2	2
S	Horseback Riding	25	26
T	Hunters	39	39
W	Non-motorized Recreation	8	8
X	No Identifiable Type	1,558	1,610
Total		**1,882**	**1,959**

Appendix C
Early Attention Letters

The early attention designation is attached to public responses in the content analysis database for a variety of reasons. Our intent is to identify responses that fall into certain key categories, such as threats of litigation or comments from government officials, etc. These designations alert the project team members to public concerns or inquiries that may require an agency response or may necessitate detailed project team review for policy, political, or legal reasons.

The early attention designated responses are primarily intended for an internal audience. The categories of responses selected are designed to meet project team needs. This report is not intended to, nor should it be construed to, obviate the need to review all responses.

CAT identified seven early attention categories. The relevant designations are outlined below and followed by report tables.

1 **Threat of harm** – Any response that threatens physical harm to administration, agency, or project personnel.

2 **Notice of appeal or litigation** – Any response that describes the respondents' intent to appeal an action or bring legal suit against the agency.

3 **Freedom of Information Act (FOIA) requests** – Any response that officially requests information and documentation under the FOIA.

4 **Provides proposals for new alternatives** – Any response that suggests a new alternative to the proposed action. These do not include critiques of alternatives or partial changes of existing alternatives.

5 **Requires detailed review** – Any response that requires detailed review. These responses may include detailed scientific or technical analysis, or significant enclosures.

5A **Provides extensive technical edits** – includes extensive use of lined out text, suggestions to delete text, and/or replace text.

5M **Provides maps** – Any response that includes map enclosures.

6 **Government entities** – Any response from an elected official, writing in his/her official capacity, representing a Federal, State, county, or municipal government. Also includes official correspondence from any government agency.

6A **Request for cooperating agency status from a government entity**.

7 **Public hearing** – Any response that requests a public hearing.

Table D1 – (4) Proposes a New Alternative

Letter Number	Name and Address	Remarks
41	Bette Stallman, Wildlife Scientist Linda Huebner, Program Coordinator Humane Society of the United States New England Regional Office 2100 L St. NW Washington, DC 20037	Respondent requests that the USFWS prohibit hunting and trapping in wildlife refuges. Respondent requests the inclusion of an alternative that emphasizes non-consumptive land uses.

Table D2 – (6) Government Entities

Letter Number	Name and Address	Remarks
97	Brenda Kelly Conservation Commission Chair 10 Mudge Way Bedford, MA 01730-2144	Respondent expresses concern for resident safety with regard to nearby hunting and asks the USFWS to address this issue.
98	Tricia Smith Carlisle Conservation Commission Chair P.O. Box 827 66 Westford Street Carlisle, MA 01741	Respondent expresses concern for public safety from proposed hunting on USFWS land. Also, respondent expresses concern regarding access for hunters across private land.
99	Ann Thompson Maynard Board of Selectmen Chair Municipal Building 195 Main Street Maynard, MA 01754	Respondent requests additional allowed uses of the refuge and encourages consistency with local planning processes.
100	Maureen Valente Town Manager 288 Old Sudbury Road Sudbury, MA 10776-1843	Respondent encourages increased refuge use for passive recreation activities; no hunting with firearms; and additional law enforcement.
101	Brian Monahan Wayland Conservation Commission Conservation Administrator Town Building 41 Cochituate Road Wayland MA 01778	Respondent requests no, or strictly regulated hunting in the refuge. Respondent also encourages the USFWS to increase its number of staff.

Letter Number	Name and Address	Remarks
102	John Dwyer Maynard Conservation Commission 4 Durant Ave Maynard, MA 01754	Respondent expresses concern regarding hunting impacts on public safety, wildlife populations, and other recreation activities.
103	Pamela Resor Massachusetts Senate State Senator District Office P.O. Box 1110 Marlborough, MA 01752	Respondent discourages hunting and trapping in the refuge.
104	Susan Pope The Commonwealth of Massachusetts House of Representatives State Representative State House, Boston 02133-1020	Respondent requests that hunting not be allowed in the refuge for safety and environmental reasons. Also, respondent discourages the USFWS from charging user fees.
106	Kathleen Farrell Board of Selectmen Chair 380 Great Road Stow, MA 01775	Respondent requests expansion of the proposed refuge acquisition boundary. Respondent also requests limitations on hunting as well as increased law enforcement for hunting activities.
108	Priscilla Ryder Conservation Commission Conservation Officer 140 Main Street Marlborough, MA 01752	Respondent encourages expansion of the proposed refuge acquisition boundary, increased law enforcement for unauthorized land use, and public education regarding the proposed introduction of hunting to the refuge.
109	William Galvin Massachusetts Historical Commission Secretary of the Commonwealth Massachusetts Archives Building 220 Morrissey Boulevard Boston, MA 02125	Respondent commends the proposed Draft CCP's compliance with Section 6 of the National Historic Preservation Act of 1966.
110	Wayne MacCallum Division of Fisheries and Wildlife Director	Respondent expresses concern for rare, threatened, and endangered species in the refuge, and encourages the USFWS to update species information.
111	Anne Gagnon Conservation Commission Conservation Administrator	Respondent encourages expansion of the proposed refuge acquisition boundary, and increased staffing to decrease user conflicts.
105	Charlie Gorss Conservation Commission Chair	Respondent supports proposed Alternative B.

Letter Number	Name and Address	Remarks
407	Patricia Perry Conservation Commission Administrative Assistant 380 Great Road Stow, MA 01775	Respondent encourages expansion of the proposed refuge acquisition boundary, discourages hunting within the refuge, and encourages coordination of refuge management with local communities.

Appendix D
Information Requests

Requests for additional information, excluding Freedom of Information Act requests, are presented in this appendix. CAT identified five information request categories. The relevant designations are outlined below and followed by report tables. In addition, requests for extension of the comment period are displayed below.

A Mailing List Only/Nothing to Code
B Request to be Removed from the Mailing List
C Request for Copy of Federal Register Notice
D General Request for Other Information
E Request for Confirmation of Receipt of Letter

Table E1 – (D) General Requests for Information

Letter Number	Name and Address	Remarks
4	Kate Wheeler Maynard Open Space Planning Committee Chair 31 Harrison St Maynard, MA 01754	Respondent requests specific agency response to the Committee's concerns and notification of the final documents release.
18	Bonnie and John Chandler 183 Prospect Hill Road Harvard, MA 01451	Respondents request information on leasing part of the cow field across from their house for sheep and goat grazing.
117	Daniel Cassidy danc@arguscl.com	Respondent requests a copy of the Draft CCP and EA, and would like to be notified of any public hearings on the subject.
132	Edmund Schofield P.O. Box 598 Boylston, MA 01505-0598	Respondent requests hard copy of the Draft CCP and EA.
200	John Dwyer mjohn.dwyer@verizon.net	Respondent requests Lindsay Krey's email address.
307	Jason Hetherington hetherjw@yahoo.com	Respondent requests online links to information regarding the proposed project.
342	David Stepp 69 Peabody Dr. Stow, MA 01775	Respondent requests information regarding proposed types of hunting and seasons for the refuge.
353	Sally Hewitt Sarah.Hewitt@Simonandschuster.com	Respondent requests notification regarding meetings or plans about bicycling in the Assabet River NWR.

Table E2 – (E) Request for Confirmation of Receipt

Letter Number	Name and Address	Remarks
374	Steve Parker 109 Moore Road Sudbury, MA 01776	Respondent requests confirmation of receipt of letter.

Table E3 – Requests for Comment Period Extension

Letter Number	Name and Address	Remarks
13	Michael Ojemann Great Meadows Neighborhood Association 153 Monsen Road Concord, MA 01742	Respondent requests extension of comment period, no specific length of time specified.
69	Hope Luder 5 Edgehill Road Billercia, MA 01862	Respondent requests extension of comment period, no specific length of time specified.
138	Kathleen Farrell 267 Sudbury Road Stow, MA 01775	Respondent requests extension of comment period, no specific length of time specified.
121	Louise Berliner Strongwhitepine@aol.com	Respondent requests extension of comment period, no specific length of time specified.
232	Rob Aldape Joropab1@mac.com	Respondent requests extension of comment period, no specific length of time specified.

Appendix E
Organized Response Report

Organized response campaigns (forms) represent 70 percent (1,334 of 1,907) of the total responses received during the public comment period for the proposal.

Forms are defined as five or more responses, received separately, but containing nearly identical text. Once a form is identified, a "form master" is entered into the database with all of the content information. All responses with matching text are then linked to this master form within the database with a designated "form number." If a response does not contain all of the text presented in a given form, it is entered as an individual letter. Duplicate responses from four or fewer respondents are also entered as individual letters.

Table F1 – Description and Number of Signatures for Each Form

Number of Form	Number of Signatures	Description of Form
1	11	FWS should reconsider the determination that horseback riding is not compatible with the purpose of the refuge. Opposes acquisition boundaries expansion.
2	1,104	FWS should not increase hunting/trapping in Oxbow National Wildlife Refuge, and prohibit hunting/trapping in the Assabet River and Great Meadows National Wildlife Refuges.
3	250	FWS should not increase hunting/trapping in Oxbow National Wildlife Refuge, and prohibit hunting/trapping in the Assabet River and Great Meadows National Wildlife Refuges. FWS should focus on habitat improvement and non-lethal methods of wildlife management.
Total:	**1,365**	

Appendix F
List of Preparers

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Appendix C: Responses to substantive comments

Planning Process

Length of comment period

Some commentors were unhappy with the timing and length of the comment period.

The comment period was 45 days long, which is a standard period for a document such as a CCP. Unfortunately, the timing of the draft CCP release came during the summer months. We knew that there were many people eagerly anticipating its release and focused on releasing the plan to the public as quickly as we could. While, there were requests to extend the comment period, they came at the very end of the comment period. The notification process to ensure that all individuals and groups were aware of an extension could not have been completed before the scheduled end of the comment period. Despite the concerns of some commentors, we did receive nearly 2,000 comments and we feel confident that we heard from all viewpoints.

Public Involvement

Many respondents feel satisfied with the FWS's level of public involvement and education; they praise the agencies past efforts and eagerly anticipate additional opportunities for interest groups and communities to stay involved in the refuge's management. Civic and conservation organizations express interest in collaborating with the FWS on management issues.

We look forward to continued involvement and collaboration as we implement the provisions of the CCP, continue day-to-day operations, and develop necessary step-down plans.

Planning Vision

Relationship to Regional Planning Efforts and Legislation

Some respondents ask for clarification of the CCP's compatibility with other regional management efforts and role in an ecosystem context.

We realize that we are one of several conservation partners in a regional ecosystem. Where appropriate, we have worked with surrounding landowners and communities to ensure management that complements adjacent lands. Unfortunately, the missions of adjacent landowners do not always match the mission and purposes of the refuge. Because of these differences, there will be times when activities that are allowed in one area are prohibited in another, or vice versa.

We look forward to continuing to work with our various conservation partners. Our management actions are focused on the NWRs by design. Our jurisdiction and planning efforts include only these lands. We will continue to consider the effects our management

actions have on the surrounding landscape. The patchwork of lands that create these refuges creates unique challenges and partnerships. The Service mission and refuge purposes must be our first priority. We understand that this priority does not always mesh with adjacent landowners' wishes and concerns. We are a part of the larger Refuge System and must consider not only our role in the surrounding ecosystem, but our role in the Refuge System, as well.

Priority Public Uses

Hunting – General

Hunting was the issue most frequently addressed in comments on the draft CCP. General hunting comments include advocates for hunting on public lands and individuals that are opposed to hunting in any form.

The National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act) lists hunting as one of six priority, wildlife-dependent public uses to receive enhanced and preferential consideration in refuge planning and management. In addition to hunting, other priority uses include fishing, wildlife observation and photography, environmental education and interpretation. Our mandate is to provide high-quality opportunities for these priority uses where they are compatible with respective refuge purposes, goals, and other management priorities.

Regardless of individual opinions about the appropriateness of hunting on the refuges, the Refuge Improvement Act requires that we give preferential consideration to the six priority, wildlife-dependent uses. We are also concerned about the potential for hunting to impact other priority uses. There appears to have been some confusion about where we are proposing to allow hunting. We have outlined the areas where hunting is to be allowed on the maps that are included as a part of the CCP.

We have included some of the additional details in regard to hunting in the Final CCPs. In order to open the refuges to additional hunting opportunities, Federal regulations will need to be changed. There will be an additional public comment period when proposed hunting regulations are released in the Federal Register. This will likely occur during the winter/spring of 2005.

Additionally, we will be developing a Hunt Management Plan for each Refuge that will outline all of the details for each specific hunting program.

Each plan will be completed in cooperation with the Massachusetts Department of Fish and Game (MA DFG), Division of Fisheries and Wildlife. Refuge areas that meet certain criteria have been evaluated to determine tracts of land that have the ability to support a high quality public hunt. We have determined that certain areas are appropriate for certain types of hunting and not others. The criteria used included: 1) an area of sufficient size to insure public safety; 2) an area more than 500 feet from occupied dwellings (Massachusetts state law); and 3) an area that provides reasonable opportunities for a successful hunt. An additional consideration that was considered in some instances is whether hunting of an area of the refuge is consistent with or complements other hunted

areas in surrounding towns.

Hunting – Safety and Conflicts with Other Users

There were a large number of individuals that expressed concerns about safety and hunting. Some individuals expressed concerns about safety while using the refuge during hunting season and the assertion that the non-hunting public will not participate in other wildlife dependent activities during the hunting seasons. Other people indicated their concerns about the proximity to the refuge boundary of homes, schools, and conservation areas. Additionally, individuals raised the possibility of hunters accessing non-refuge lands or misguided arrows, shotgun slugs, or pellets injuring someone not on the refuge.

There will be areas on the refuges where no hunting will be allowed. In some cases, these are highly used areas, such as the Concord Impoundments at Great Meadows NWR. In others, we have restricted hunting because of the mandated safety zones. We realize that there may be people that will not visit the refuges during specific seasons. As mentioned previously, we have a responsibility to facilitate all forms of wildlife-dependent public use on the refuges, when possible, and there may be days when people engaged in hunting will have preferential access to parts of the refuges. National policy encourages refuges to follow state hunting regulations, but we do have the authority to set our own dates and times if needed and we can limit the number of hunting permits issued. We will evaluate these options in the development of the Hunt Management Plan for each refuge, but do not anticipate a need to include such restrictions at this time.

We strive to achieve a balance between consumptive and non-consumptive uses on the refuges. Because Massachusetts does not allow hunting on Sunday, at a minimum non-hunters will be free to enjoy our nature trails with no concern about possible hunting conflicts on those days during the hunting seasons. In addition, experience managing hunts both at Oxbow Refuge and at other refuges within the system shows that many areas can safely support both hunting and non-consumptive uses, such as wildlife observation, at the same time. We are confident that we can develop a hunting program that will safely provide opportunities for wildlife-dependent public use to a majority of our refuge visitors.

We contacted the Massachusetts Division of Fisheries and Wildlife to obtain hunting accident statistics. We considered investigating such statistics in other states, but decided that Massachusetts has a higher population density than the majority of other states with readily available accident statistics such as Pennsylvania, North Carolina, and Texas. According to Massachusetts Law, any person involved in a hunting accident or any person with knowledge of a hunting accident must file a report with the state or local police, who, in turn, must file a report with the Division of Law Enforcement. The Massachusetts Environmental Police, Hunter Education Program reports hunting accidents in the *Hunting Accident Report: 1995 – 2002*. During the reporting period, there were 38 hunting accidents. None of the accidents were fatal and none involved any individuals who were not hunting at the time of the accident. According to the *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation,* there were 1.58 million days of hunting that occurred in Massachusetts in 2001. During that year there were 3 hunting

accidents, the corresponding accident rate is extremely low.

Specific areas were mentioned by local residents as being of concern. Some commentors indicated distances that bullets travel when fired from a rifle (effective range). The areas that were mentioned by commentors as being potential safety areas were:

Great Meadows NWR
Concord Impoundments
O'Rourke, Greenough, and Foss Properties in Carlisle
Dudley Road area in Bedford
Area along the Concord River in Billerica
Areas adjacent to Wayland Conservation Property
Heard Pond

Assabet River NWR
Stearns Lane and Hudson Road in Sudbury
The Maynard School Complex
Firecut Lane area in Sudbury

Based upon the concerns expressed in response to the draft, we reviewed the most up-to-date aerial photographs available. We analyzed the locations of the 500-foot safety zones around existing homes to determine whether or not a reasonable hunting area could be provided given the constraints associated with the safety zones. In addition to the aerial photo analysis, we went to the refuges to determine how visible the homes near the refuge are from inside the refuge. We would like to remind individuals that by state regulation there is a 500 foot zone around any inhabited structure. *Hunting, whether by gun or bow, is not allowed in this area unless the hunter received permission from the owner of the building. It is the hunter's responsibility to ensure that he/she is more than 500 feet from any such buildings.* There are times in which the safety zone extends into the refuge. Hunting will not be allowed within these areas.

However, the Service will assist hunters in delineating any areas where there may be confusion as to the actual location of the safety zone. The information that we gathered enabled us to make informed decisions about the appropriateness of areas for different hunting activities. We will require hunters to obtain an annual hunting permit. We may prepare maps showing the hunt areas in detail. Areas with adjacent homes can be depicted on the maps as a further guide to inform hunters of safety zones adjacent or within the refuge.

Also, there is some confusion as to whether or not hunting is being proposed in certain locations. We would like to clarify our original proposal and highlight the following changes:

- Hunting is not proposed for the Concord Impoundments.

- The waterfowl hunting area on the Concord River and associated wetlands starts at the Route 225 Bridge and extends upstream to the area where refuge ownership ends on the west side of the Concord River in the town of Carlisle. This is the area

at the northern end of the O'Rourke property. The area along the Concord River in Billerica has been removed from consideration for waterfowl hunting. The entire river in that area is within the 500 foot safety zone required by state hunting regulations. Hunting on the river in that area is illegal.

- We understand the concern regarding hunting on the Greenough property. We will ensure that the boundary is clearly marked. The deer hunting opportunities on the property will be limited to archery only.

- The area adjacent to private and conservation property in the vicinity of Dudley Road in Bedford is proposed as archery only for deer hunting.

- In the Sudbury Division of the refuge, the proposed waterfowl hunting area south to Route 20 has been reduced. The waterfowl hunting opportunities adjacent to refuge lands ou to the center line of the Sudbury River south of Route 20 have bee reduced from 193 acres to 77. Additionally, no waterfowl hunting will be allowed between Route 20 and the Wayland School Complex. Waterfowl hunting will be allowed in a limited area upstream of the school along the Sudbury River south of Heard Pond. The revised hunting area will be a minimum of 1,000 feet from the school playing fields. Please see the maps in the Great Meadows NWR CCP for a depiction of this area.

- In the South section of the Assabet River NWR, we have changed the designation to Archery Only.

- Based upon the comments that we received regarding Hudson Road and Stearns Lane, we made a revision to the hunting areas on the North section of the Assabet River NWR. The area outside of the entire Patrol Road has been designated Archery Only.

Hunting – Various Species

Commentors indicated that it was necessary for the Service to conduct detailed surveys of wildlife populations before implementing a hunt program.

The hunting of migratory bird species is managed from a national point of view. The Service monitors the population status of all migratory bird game species and works with the States to set season lengths and harvest limits. Hunting is managed in a way that does not contribute to a decline in waterfowl and other migratory game bird populations.

The hunting of resident species, such as deer, rabbits, and squirrels, falls within the responsibility of state fish and wildlife agencies, which also monitor and manage populations to ensure healthy ecosystems, sustainable populations, and a certain level of hunter success. We work in partnership with the Massachusetts Division of Fisheries and Wildlife and rely on their knowledge and expertise to determine the appropriateness of hunting seasons. Any decisions we make to limit or prevent the harvest of resident species on any refuge is based on other management concerns and not on a concern about the

population of a given species. State fish and wildlife agencies have an excellent record of sound, professional wildlife management, and this is true in Massachusetts as well.

Fishing

Most fishing comments are directed toward the proposal to allow fishing at Puffer Pond on the Assabet River NWR. There is considerable support for fishing on Puffer Pond. There are also a number of respondents who request that fishing be prohibited on Puffer Pond. These individuals argue that anglers will disturb nesting birds, erode the shoreline, trample vegetation, contribute to the spread of invasives, and drag boats through the refuge.

Fishing is one of the priority wildlife dependent uses for national wildlife refuges, where compatible. As such, the staff has determined that fishing is compatible with refuge purposes. Staff from Assabet River NWR will finalize the details of fishing on Puffer Pond as a part of the Fishing Management Plan. Staff will ensure that impacts to the resources in and surrounding the pond are minimized. This is evidenced by the stipulations already included in the draft plan. No motorized boats will be allowed, greatly reducing the likelihood of invasive species being brought to the pond. Public use in general causes some disturbance of vegetation and wildlife. We will manage all public uses, including fishing, to minimize the disturbance and ensure that the level of disturbance does not materially interfere with the purposes of the refuges. We share the concern about the potential introduction of invasive species, as well as other types of disturbance. We will continue to monitor disturbance caused by public uses of the refuges and take any action that we deem necessary or appropriate.

Environmental Education

A majority of commentors who chose to address environmental education support the efforts and facilities proposed in Alternative B, advocating more environmental education for people of all ages. Several respondents encourage completion of the proposed Sudbury River interpretive canoe trail. Some of the commentors encourage the FWS to think bigger, and develop its educational plan in concert with other regional entities and efforts.

Environmental education is one of the priority wildlife dependent uses for national wildlife refuges. As such, the staff has determined that it is compatible with refuge purposes and will continue to work to provide these opportunities. The staff is encouraged by the support that individuals and groups have shown for environmental education. We look forward to continuing and expanding educational opportunities associated with the refuges.

Wildlife Observation Trails

Some of the organizations and towns that commented on the CCP included requests for trails to be developed in specific areas that would connect to adjacent trail systems. In some cases, the requests are for formalizing trails that have been created by individuals for unauthorized access. In other cases, the requests are for new trails that would provide

access to new areas.

Refuge staff will develop a system for evaluating such requests. This review system will provide refuge staff with the necessary tools to evaluate the need for and effects of recommended trails.

Non-wildlife Dependent Public Uses

Dog Walking

A large number of commentors assert that given the popularity and demand for areas to walk dogs, and the fact that parts of the refuge have been used responsibly for decades by dog-walkers, FWS should continue to allow dog walking and should authorize it at Assabet River NWR. Some commentors express support for a ban of dogs from the refuge; they cited safety concerns, conflicts between dog walkers and bird watchers, and owners that do not clean up after their dogs.

All of the refuges in the Eastern Massachusetts National Wildlife Refuge Complex were created with purposes related to protecting, managing, and conserving native wildlife. The 1997 Refuge Improvement Act establishes the mission of the Refuge System as "to preserve a national network of lands and waters for the conservation and management of fish, wildlife, and plant resources of the United States for the benefit of present and future generations." The Refuge Improvement Act further stipulates that all activities occurring on refuges must be compatible with wildlife conservation and the specific purposes for which a refuge was established. This is an important distinction from other public lands and recreation areas; refuges have a narrow management focus and are not multi-purpose lands. Six public uses were identified by the Refuge Improvement Act as the priorities for receiving enhanced consideration on refuges. Dog walking is not one of the six priority public uses, nor are dogs (except hunting, seeing or hearing dogs) necessary to support the safe, practical, and effective conduct of the priority public use programs we would be implementing on the refuge.

Dogs running off leash and piles of dog waste left on trails or tossed in the bushes are consistent problems, not isolated incidences. Several circumstances prompted the elimination of this activity on the refuges, including

- Dogs can intimidate other refuge visitors, and deprive them of the peace that refuges provide. Visitation to the National Wildlife Refuges is expanding, potentially aggravating user conflicts;
- Dog feces left on trails are an unhealthy and unsightly nuisance to refuge visitors and impact refuge vegetation. The presence of dog feces on public trails is one of the most common complaints we receive;
- Dogs, whether leashed or unleashed, conflict with refuge efforts to provide recreational opportunities for a diversity of visitors, including those limited to handicapped accessible trails, and the many school groups which visit the refuges for environmental education;
- Dog walking has resulted in user conflicts with persons engaged in priority public uses (bird watching, photography, see below);

- Instinctively, dogs want to chase wildlife. Unleashed dogs commonly chase nesting wildlife, which can result in destruction of ground nests and young. Dogs may step on nests or young chicks, as they "freeze" in response to danger;
- Many dog owners consistently remove their dogs from leashes when they are away from the parking lots and believe they are unlikely to be observed by a refuge ranger;
- Wildlife can't distinguish between dogs on leashes and unleashed dogs. In the presence of a dog, many species will abandon their nests or young, leaving them vulnerable to be killed by predators, or die from starvation or exposure.

We realize that many dog owners are responsible owners and have a strong emotional connection to the refuge and to walking their dog on the refuge. We realize that many people will not be happy with this decision. Nevertheless, we firmly believe that the overall adverse impacts from dog walking on wildlife and other visitors engaged in wildlife-dependent public use justify this prohibition. Our decision is also consistent with land managers throughout the State who manage lands specifically for wildlife. Massachusetts Audubon Society and State of Massachusetts wildlife sanctuary lands also do not allow pets.

Horseback Riding

A large number of commentors are opposed to a prohibition on horseback riding on any of the refuges. They are concerned that not allowing horseback riding in the refuge will compromise access to other conservation/state/local forest trails immediately surrounding the refuge. In addition, they point to the economic benefits of horseback riding.

We have decided to maintain our prohibition of horseback riding on refuge trails. This activity does not promote wildlife conservation, is not one of our six priority public uses, nor is it necessary to support the safe, practical, and effective conduct of a priority public use on the refuges.

While we appreciate the desire for horseback riding opportunities on Assabet River, Great Meadows, and Oxbow National Wildlife Refuges, we do not believe that these relatively small refuges are appropriate places for horseback riding. Existing refuge trails are not designed to accommodate horses. Most of our trails are not wide enough for riders and walkers to avoid each other, nor are trails designed to withstand the impact of horses. This is especially true in wetter areas. Another issue with horse use is the waste left on trails. It is well-documented that horse waste introduces seeds from non-native and invasive vegetation. Further, the horse waste is unsightly and detracts from other visitors' experiences when they have to watch for and avoid stepping in it. We are supporting an appropriate level and type of public use on our refuges by maintaining our focus on wildlife-dependent public uses.

Jogging

Joggers view the refuge as a safe, peaceful place to pursue their activity, and would like more information as to why jogging would be banned.

As indicated in the draft CCP/EA, we will be investigating the impacts of jogging to determine whether or not this is an appropriate use and a compatible use. Jogging is not a priority public use nor is it necessary to support one of the six priority public uses. Currently, there are a relatively high number of individuals that participate in jogging on the refuges. Other refuges have documented impacts to wildlife caused by jogging. We have issued a compatibility determination that indicates that, based on our current knowledge, jogging is compatible with refuge purposes. If we gather information to the contrary, we will issue a new compatibility determination with appropriate public comment opportunities.

Picnicking

Some respondents view picnicking as a harmless past time that allows people to enjoy the refuge's beauty.

We would like to take this opportunity to clarify our position on picnicking. We believe that the draft CCP/EA conveyed a change that we did not intent. We do not intend to prohibit a refuge visitor from sitting on a bench or under a tree and eating a snack or drinking a beverage. However, we will not issue permits for large events, such as family reunions, where a meal is a normal part of the event to occur on the refuges, nor will we provide picnic tables or specific locations for picnicking.

Bicycling

Similar to jogging, a number of commentors assert that the refuge offers a safe, traffic-free environment for bicycling. By not allowing bicycling on the refuges, it is asserted that the FWS will be creating a gap in the local trail systems. Some cyclists are willing to be flexible as to when and where they can pursue their sport. Some of the commentors suggest allowing cycling on paved roads only. Of greatest interest to many of the commentors are the Patrol Road on Assabet River NWR and the Tank Road on Oxbow NWR.

Bicycling is not compatible with the refuge purposes for each of the 3 refuges. Bicycles frighten wildlife and cause changes in behavior that have potential adverse impacts to species. While there are places where bicycling can enhance wildlife dependent opportunities, in general the intention of a visitor on a bicycle is to engage in the act of cycling or transportation, not to observe wildlife. The refuges are small enough that bicycling is not needed to facilitate a wildlife-dependent public use. Additionally, while there may be some existing roads on the refuges (particularly Assabet River NWR) which seem to lend themselves to cycling, our long term plans for the refuges will include some road removal and return to a natural state.

Snowmobiling

Snowmobilers describe themselves as law-abiding recreationists that are respectful of others and wildlife. One local snowmobile club would like to establish a trail through the refuge, maintained by the club, for the club's enjoyment.

Snowmobiling is not a wildlife-dependent use of the refuges. Snowmobiles tend to frighten wildlife and can adversely impact wintering species. The refuges are small enough that non-motorized use (such as cross-country skiing or snowshoeing) would be the preferred method of travel for facilitation of wildlife dependent uses of the refuges during winter months.

Gathering

One respondent requested permission to collect mushrooms and suggested a daily limit for individuals that would like to collect them.

The picking of fruit, plants, and mushrooms is not allowed on the refuges. These plants and fungi are components of the natural ecosystem and can provide food for refuge wildlife. With the large volumes of refuge visitors, there could be significant depletion of certain plants and mushrooms as well as unauthorized access off-trail to collect these specimens if this were allowed. Our intention in managing these refuges is to allow natural processes to occur as much as possible, with specific land management techniques to maintain or restore specific habitat types for wildlife. Gathering of plants, mushrooms and other refuge resources (such as rocks found on stone walls) is not appropriate.

Fees

Commentors provided a number of arguments for and against fees. Additionally, some commentors questioned the viability of a fee system for the refuges. Some of the concerns raised include the appropriateness of fees on Federal land, a potential deterrence of visitors from low-income families or neighborhoods, and the costs of enforcement. Others point out the need to support local lands that are under-funded by Federal budgets.

In response to concerns expressed about the cost of a pass, we have lowered the annual pass fee from $20 in our original proposal to $12. Additional detail about the fees has been added to the final CCPs for each of the refuges.

Fees will be used to support local projects on the refuges. The only way the Service will be able to achieve, maintain and provide a high quality of visitor service in the future is with additional funds. Unfortunately, our budget is insufficient to meet our visitor services needs. Failure to receive additional revenues will have a significant impact on our ability to provide quality opportunities for visitors to engage in wildlife-dependent public uses. Fees are fair because they are paid by refuge users.

Land Acquisition

A large number of commentors expressed concern over the lack of additional lands within the proposed acquisition boundary. Some individuals specifically mentioned the Devens South Post land that has been identified as part of the Base Closure and Realignment Act as land to be transferred to Oxbow NWR. Other individuals expressed concern that some town conservation lands adjacent to the existing refuges were within the acquisition

boundary. These individuals expressed a preference that the land remains in town control.

Assabet River, Great Meadows, and Oxbow NWRs are a part of the much larger Refuge System. The Service is developing a plan for strategic growth of the Refuge System. This plan will allow the Service to prioritize land acquisition and boundary expansions for the System as a whole. The process for changing land acquisition boundaries is long and complex and takes a great deal of staff time. The plan for strategic growth will also allow Refuge System staff to focus boundary expansion efforts to those areas that are of greatest value to the System as a whole. Certainly, the refuges encompassed in the draft CCP/EA contribute a great deal to fulfilling the Refuge System mission. Any boundary expansion must also be shown to have a necessary contribution. Staff will continue to work toward boundary expansions within Service policy and guidelines.

Expansion of the boundaries at locations that provide important habitats is still possible. Staff will need to pursue these acquisition boundary issues as a separate process. Congress has specifically identified the Devens South Post land as appropriate for transfer to the Service. The transfer would not be hindered by the lack of an acquisition boundary around that land.

We would like to point out that the acquisition boundary identifies natural areas that are important to the purposes of the refuges. However, the Service does not plan to condemn land that is being protected by other entities. In the event that a group or individual, such as a town conservation commission, is attempting to sell some of this land, the Service would be interested in acquiring the land rather than allowing it to be developed.

Buildings and Facilities

Respondents voiced a myriad of opinions regarding what kinds of buildings and facilities should be provided at the refuge. Citing the importance of public education, many people ask the FWS to locate kiosks at strategic locations throughout the refuge. Comments regarding refuge parking focus on lot location with a number of people discouraging parking at Heard Pond. These respondents contend that there has been too much garbage dumping and vandalism at the Heard Pond site to make it a desirable parking place.

We are sensitive to the fact that there are a wide variety of opinions regarding development of buildings, restroom facilities, and parking areas at the refuges. We will work to ensure that buildings are sited to provide the greatest benefit to the groups that will use them, while at the same time reducing any associated impacts. Where appropriate, we will site and build kiosks to provide educational and informational opportunities. We understand the concern over past activities at Heard Pond. The proposed parking lot will be located along the road and not set back like the previous lot. We have proposed a limited expansion of no more than 6 cars depending on available area that will allow more visitors to enjoy the area.

NHESP suggested working cooperatively with the Service for review of impacts to state-listed species when construction or demolition projects are proposed.

The Service will continue to include NHESP in review of appropriate projects.

Staffing

Most commentors feel that adequate refuge staffing is essential. While many people assert that Alternative B will meet desired staffing levels, a number of other respondents contend that proposed staffing levels are too low. These people cite anticipated user conflicts, present refuge hazards, and the current downsizing trend in government as reasons to increase proposed staffing levels. Some respondents suggest utilizing community groups and/or to form partnerships with volunteer organizations to supplement staffing needs.

We appreciate the support for increased staffing levels. We have proposed the level of staffing that we feel is appropriate to implement the programs outlined in the CCP.

Wild and Scenic Rivers

The one concern regarding wild and scenic river designation expressed by several respondents is that hunting is incompatible with this designation and should be prohibited within these areas.

The Wild & Scenic Rivers Act (WSR) does not prohibit hunting, nor does it indicate that hunting is incompatible with the intent of the WSR designation.

Enforcement

Respondents who comment on enforcement indicate that the level of enforcement on the refuge needs to increase. The key areas identified by respondents as needing increased policing efforts are off-highway vehicle trespass, poaching, dumping, trespass, and vandalism.

We are aware of a number of violations that occur on refuge lands. Our law enforcement staff is working to correct these violations and are bringing in outside help when necessary. The number of violation notices issued during the past year is a testament to our focused law enforcement efforts. We look forward to implementation of the CCP and the opportunity to expand our law enforcement presence through the potential addition of staff, agreements with local law enforcement agencies, and continued cooperation with State environmental police officers.

Invasives

Many respondents support efforts to eliminate invasive non-native species. Several respondents raise concerns about invasives at Puffer Pond, given new fishing access. Concerns about targeted species are raised in two cases: one respondent argues that cattails are native, and should not be removed; a number of respondents argue that mute swans are harmless.

We will develop specific strategies to deal with control and elimination of invasive species as a part of the Habitat Management Plan. We are aware of the problem with invasives at nearby lakes and ponds. We have proposed to allow only non-motorized boats on Puffer Pond to help ensure that new invasive species are not introduced to the pond.

State Listed Species

The Massachusetts Natural Heritage and Endangered Species Program (NEHSP) provided changes and edits to the Species Lists for each of the refuges, especially concerning the state listed species.

We have reviewed the suggestions and incorporated them into the species lists.

Wildlife Surveys

NEHSP suggested that we complete surveys to determine areas that should be closed to public use and prior to opening roads or trails for use.

Staff will continue to use survey information, along with local knowledge and known locations of sensitive species to determine whether there is a need to close areas of the refuge that are open or before opening areas to new public access opportunities.

Literature Cited

An individual suggested inclusion of a comprehensive bibliography of biodiversity for the Great Meadows NWR area that has been published.

We have included a reference to this bibliography in the Great Meadows NWR CCP.

Editorial/Corrections

A number of commentors made suggestions that were editorial or that offered corrections to place names, geography, or history.

We have made the corrections where appropriate.

Alternatives

The Humane Society of the Unites States expressed concern that the CCP/EA did not consider a reasonable range of alternatives. HSUS urged the Service to "give full consideration to an alternative that would emphasize non-consumptive uses, non-lethal approaches to conflicts with wildlife, aggressive acquisition of land that could provide important habitat for refuge wildlife, and removal of invasive plant species.

We worked hard to ensure consideration of the reasonable range of alternatives that were presented in the draft CCP/EA. Each of the items mentioned was considered and the majority are included in the final CCP. We analyzed the effects of continuing no-hunting on Assabet River and Great Meadows NWR, along with maintaining the existing level of

hunting on Oxbow NWR as a part of Alternative A. Our current management plan is a balance of consumptive and non-consumptive uses with a focus on non-consumptive uses only for the majority of the year. All of our alternatives emphasize non-lethal approaches to wildlife conflicts with lethal control only utilized when our managers and biologists have determined that non-lethal controls have not been effective. Similarly, we will continue to acquire land as dictated by Service policy and as outlined under the "land acquisition" heading earlier in this section. Finally, removal of non-native invasive plant species is included in our final CCP and will be outlined further in our Habitat Management Plan.

Support for each alternative [No response required]

A number of commentors expressed support for all or portions of specific alternatives without citing specific reasons for doing so. The greatest number of such respondents indicated support for Alternative B or variations of Alternative B.

Appendix D: Species Lists

Table D-1: Birds of Great Meadows NWR

Scientific Name	Common Name(s)	Status
Gaviidae (Loons)		
Gavia immer	common loon	SC
Podicipedidae (Grebes)		
Podiceps auritus	horned grebe	
Podilymbus podiceps	pied-billed grebe	E
Phalacrocoracidae (Cormorants)		
Phalacrocorax auritus	double-crested cormorant	
Ardeidae (Herons, Egrets, and Bitterns)		
Botaurus lentiginosus	American bittern	E
Ixobrychus exilis	least bittern	E
Ardea herodias	great blue heron	
Ardea alba	great egret	
Egretta thula	snowy egret	
Egretta caerulea	little blue heron	
Bubulcus ibis	cattle egret	
Butorides virescens	green heron	
Nyeticorax nycticorax	black-crowned night-heron	
Threskiornithidae (Ibises and Spoonbills)		
Plegadis falcinellus	glossy ibis	
Anatidae (Ducks, Geese, and Swans)		
Cygnus olor	mute swan	
Chen caerulescens	snow goose	
Branta canadensis	Canada goose	
Aix sponsa	wood duck	
Anas crecca	green-winged teal	
Anas rubripes	American black duck	
Anas platyrhynchos	mallard	
Anas acuta	northern pintail	
Anas discors	blue-winged teal	
Anas clypeata	northern shoveler	
Anas strepera	gadwall	
Anas penelope	Eurasian wigeon	
Anas americana	American wigeon	
Aythya valisineria	canvasback	
Aythya americana	redhead	
Aythya collaris	ring-necked duck	
Aythya marila	greater scaup	
Aythya affinis	lesser scaup	
Bucephala albeola	bufflehead	
Bucephala clangula	common goldeneye	
Lophodytes cucullatus	hooded merganser	
Mergus merganser	common merganser	
Mergus serrator	red-breasted merganser	
Oxyura jamaicensis	ruddy duck	

Cathartidae (New World Vultures)		
Cathartes aura	turkey vulture	
Accipitridae (Hawks, Eagles, Kites, Etc.)		
Pandion haliaetus	osprey	
Halieaetus leucocephalus	bald eagle	E
Circus cyaneus	northern harrier	T
Accipiter striatus	sharp-shinned hawk	SC
Accipiter cooperii	Cooper's hawk	
Accipiter gentilis	northern goshawk	
Buteo lineatus	red-shouldered hawk	
Buteo platypterus	broad-winged hawk	
Buteo jamaicensis	red-tailed hawk	
Buteo lagopus	rough-legged hawk	
Falconidae (Falcons and Caracaras)		
Falco sparverius	American kestrel	
Falco columbarius	merlin	
Falco peregrinus	peregrine falcon	
Phasianidae (Grouse, Partridges, Pheasants, Turkeys and Quail)		
Phasianus colchicus	ring-necked pheasant	
Bonasa umbellus	ruffed grouse	
Odontophoridae (Quail and Northern Bobolink)		
Colinus virginianus	northern bobwhite	
Rallidae (Rails, Gallinules and Coots)		
Coturnicops noveboracensis	yellow rail	
Rallus elegans	king rail	
Rallus limicola	Virginia rail	
Porzana carolina	sora	
Gallinula chloropus	common moorhen	
Fulica americana	American coot	
Charadriidae (Plovers and Lapwings)		
Pluvialis squatarola	black-bellied Plover	
Pluvialis dominica	American golden plover	
Charadrius semipalmatus	semi-palmated plover	
Charadrius vociferus	killdeer	
Scolopacidae (Sandpipers)		
Tringa melanoleuca	greater yellowlegs	
Tringa flavipes	lesser yellowlegs	
Tringa solitaria	solitary sandpiper	
Actitis macularia	spotted sandpiper	
Limosa haemastica	Hudsonian godwit	
Calidris alba	sanderling	
Calidris pusilla	semi-palmated sandpiper	
Calidris mauri	Western sandpiper	
Calidris minutilla	least sandpiper	
Calidris fuscicollis	white-rumped sandpiper	
Calidris bairdii	Baird's sandpiper	
Calidris melanotos	pectoral sandpiper	

Calidris alpina	dunlin
Calidris himantopus	stilt sandpiper
Limnodromus griseus	short-billed dowitcher
Limnodromus scolopaceus	long-billed dowitcher
Gallinago gallinago	common snipe
Scolopax minor	American woodcock
Phalaropus tricolor	Wilson's phalarope
Phalaropus lobatus	red-necked phalarope
Phalaropus fulicaria	red phalarope

Laridae (Gulls, Terns and Allies)

Larus delawarensis	ring-billed gull
Larus argentatus	herring gull
Larus glaucoides	Iceland gull
Larus hyperboreus	glaucous gull
Larus marinus	great black-backed gull
Sterna hirundo	common tern
Chlidonias niger	black tern
Sterna antillarum	least tern

Columbidae (Pigeons and Doves)

Columba livia	rock dove
Zenaida macroura	mourning dove

Cuculidae (Cuckoos and Allies)

Coccyzus erythropthalmus	black-billed cuckoo
Coccyzus americanus	yellow-billed cuckoo

Strigidae (Typical Owls)

Otus asio	Eastern screech-owl
Bubo virginianus	great horned owl
Strix varia	barred owl
Asio flammeus	short-eared owl

Caprimulgidae (Goatsuckers)

Chordeiles minor	common nighthawk
Caprimulgus vociferus	whip-poor-will

Apodidae (Swifts)

Chaetura pelagica	chimney swift

Trochilidae (Hummingbirds)

Archilochus colubris	ruby-throated hummingbird

Alcedinidae (Kingfishers)

Ceryle alcyon	belted kingfisher

Picidae (Woodpeckers)

Melanerpes erythrocephalus	red-headed woodpecker
Sphyrapicus varius	yellow-bellied sapsucker
Picoides pubescens	downy woodpecker
Picoides villosus	hairy woodpecker
Colaptes auratus	Northern flicker
Dryocopus pileatus	pileated woodpecker

Tyrannidae (Tyrant Flycatchers)

Contopus cooperi	olive-sided flycatcher
Contopus virens	Eastern wood-pewee

Empidonax flaviventris	yellow-bellied flycatcher
Empidonax alnorum	alder flycatcher
Empidonax traillii	willow flycatcher
Sayornis phoebe	Eastern phoebe
Myarchus crinitus	great crested flycatcher
Tyrannus tyrannus	Eastern kingbird

Laniidae (Shrikes)

Lanius ludovicianus	loggerhead shrike
Lanius excubitor	Northern shrike

Vireonidae (Vireos)

Vireo griseus	white-eyed vireo
Vireo flavifrons	yellow-throated vireo
Vireo solitarius	blue-headed vireo
Vireo gilvus	warbling vireo
Vireo olivaceus	red-eyed vireo

Corvidae (Jays, Magpies, and Crows)

Cyanocitta cristata	blue jay
Corvus brachyrhynchos	American crow
Corvus ossifragus	fish crow

Alaudidae (Larks)

Eremophila alpestris	horned lark

Hirundinidae (Swallows)

Progne subis	purple martin
Tachycineta bicolor	tree swallow
Stelgidopteryx serripennis	Northern rough-winged swallow
Riparia riparia	bank swallow
Petrochelidon pyrrhonota	cliff swallow
Hirundo rustica	barn swallow

Paridae (Titmice and Chickadees)

Poecile atricapilla	black-capped chickadee
Baeolophus bicolor	tufted titmouse

Sittidae (Nuthatches)

Sitta canadensis	red-breasted nuthatch
Sitta carolinensis	white-breasted nuthatch

Certhiidae (Creepers)

Certhia americana	brown creeper

Troglodytidae (Wrens)

Troglodytes aedon	house wren
Troglodytes troglodytes	winter wren
Cistothorus platensis	sedge wren
Cistothorus palustris	marsh wren

Regulidae (Kinglets)

Regulus satrapa	golden-crowned kinglet
Regulus calendula	ruby-crowned kinglet

Silviidae (Gnatcatchers)

Polioptila caerulea	blue-gray gnatcatcher
Sialia sialias	Eastern bluebird

Turdidae (Thrushes)

Catharus fuscescens	veery
Catharus minimus	gray-cheeked thrush
Catharus ustulatus	Swainson's thrush
Catharus guttatus	hermit thrush
Hylocichla mustelina	wood thrush
Turdus migratorius	American robin

Mimidae (Mimic Thrushes)

Dumetella carolinensis	gray catbird
Mimus polyglottos	Northern mockingbird
Toxostoma rufum	brown thrasher

Sturnidae (Starlings)

Sturnus vulgaris	European starling

Motacillidae (Wagtails and Pipits)

Anthus rubescens	American pipit

Bombycillidae (Waxwings)

Bombycilla cedrorum	cedar waxwing

Parulidae (Wood-warblers)

Vermivora pinus	blue-winged warbler
Vermivora chrysoptera	golden-winged warbler
Vermivora peregrina	Tennessee warbler
Vermivora ruficapilla	Nashville warbler
Parula americana	Northern parula
Dendroica petechia	yellow arbler
Dendroica pensylvanica	chestnut-sided warbler
Dendroica magnolia	magnolia warbler
Dendroica tigrina	Cape May warbler
Dendroica caerulescens	black-throated blue warbler
Dendroica coronata	yellow-rumped warbler
Dendroica virens	black-throated green warbler
Dendroica fusca	blackburnian warbler
Dendroica pinus	pine warbler
Dendroica discolor	prairie warbler
Dendroica palmarum	palm warbler
Dendroica castanea	bay-breasted warbler
Dendroica striata	blackpoll warbler
Mniotilta varia	black-and-white warbler
Setophaga ruticilla	American redstart
Seiurus aurocapillus	ovenbird
Seiurus noveboracensis	Northern waterthrush
Oporornis philadelphia	mourning warbler
Geothlypis trichas	common yellowthroat
Wilsonia pusilla	Wilson' s warbler
Wilsonia canadensis	Canada warbler
Icteria virens	yellow-breasted chat

Thraupidae (Tanagers)

Piranga olivacea	scarlet tanager

Emberizidae (Warblers and Sparrows)

Pipilo erythrophthalmus	Eastern towhee
Spizella arborea	American tree sparrow
Spizella passerina	chipping sparrow
Spizella pusilla	field sparrow

Pooecetes gramineus	vesper sparrow
Passerculus sandwichensis	Savannah sparrow
Ammodramus caudacutus	saltmarsh sharp-tailed sparrow
Passerella iliaca	fox sparrow
Melospiza melodia	song sparrow
Melospiza lincolnii	Lincoln's sparrow
Melospiza georgiana	swamp sparrow
Zonotrichia albicollis	white-throated sparrow
Zonotrichia leucophrys	white-crowned sparrow
Junco hyemalis	dark-eyed junco
Plectrophenax nivalis	snow bunting

Cardinalidae (Cardinals and Allies)

Cardinalis cardinalis	northern cardinal
Pheucticus ludovicianus	rose-breasted Grosbeak
Passerina cyanea	indigo bunting
Spiza americana	dicksissel

Icteridae (Blackbirds, Orioles and Allies)

Dolichonyx oryzivorus	bobolink
Agelaius phoeniceus	red-winged Blackbird
Sturnella magna	eastern meadowlark
Euphagus carolinus	rusty blackbird
Quiscalus quiscula	common grackle
Molothrus ater	brown-headed cowbird
Icterus spurius	orchard oriole
Icterus galbula	Baltimore oriole

Fringillidae (Finches)

Pinicola enucleator	pine grosbeak
Carpodacus purpureus	purple finch
Carpodacus mexicanus	house finch
Carduelis flammea	common redpoll
Carduelis pinus	pine siskin
Carduelis tristis	American goldfinch
Coccothraustes vespertinus	evening grosbeak

Passeridae (Old World Sparrows)

Passer domesticus	house sparrow

This list follows the format of the Checklist of the Birds of Massachusetts, compiled by Bradford G. Blodget, Massachusetts State Ornithologist. The state list follows, with modifications, the rules used by Bull (The Birds of the New York Area, Harper and Row, New York, 1964) in establishing a list of the birds of the New York City area. According to these rules as modified, a species is considered to be authentic for Massachusetts if at least one of the following three prerequisites is satisfied: 1) a specimen is collected; 2) a recognizable and definitive photograph or videotape taken, examined by at least three qualified observers and documented in the literature; or 3) an unambiguous sight record of an easily identifiable species corroborated by three or more observers with extensive field experience in Massachusetts and documented in the literature.

Codes Used in Species List

E - State endangered. Native species in imminent danger of extirpation from Massachusetts.

T - State threatened. Native species which are likely to become state endangered in the future if current trends in habitat loss or other detrimental factors remain unchanged.

SC - State concern. Native species which do not apply under the above categories but are additionally listed due to various factors or rarity and/or vulnerability.

Table D-2: Butterflies of Great Meadows NWR

Scientific Name	Common Name(s)
Papilionidae (True Butterflies)	
Papilio polyxenes	black swallowtail
Papilio glaucus	Eastern tiger swallowtail
Papilio canadensis	Canadian tiger swallowtail
Papilio troilus	spicebush swallowtail
Pieridae	
Pieris rapae	cabbage white
Colias philodice	clouded sulphur
Colias eurytheme	orange sulphur
Lycaenidae	
Fineseca tarquinius	harvester
Lycaena hyllus	bronze copper
Lycaena epixanthe	bog copper
Satyrium titus	coral hairstreak
Satyrium acadium	Acadian hairstreak
Satyrium edwardsii	Edward's hairstreak
Satyrium calanus	banded hairstreak
Satyrium caryaevorum	hickory hairstreak
Satyrium liparops	striped hairstreak
Callophrys grineus	juniper hairstreak
Callophrys augustinus	brown elfin
Callophrys irus	frosted elfin
Callophrys henrici	Henry's elfin
Callophrys niphon	Eastern pine elfin
Strymon melinus	gray hairstreak
Everes comyntas	Eastern tailed-blue
Celastrina argiolus	spring azure
Glaucopsyche lygdamus	silvery blue
Nymphalidae	
Speyeria cybele	great spangled fritillary

Speyeria aphrodite	Aphrodite fritillary
Boloria selene	silver-bordered fritillary
Chlosyne harrisii	Harris' checkerspot
Phycoides tharos	pearl crescent
Euphydryas phaeton	Baltimore checkerspot
Polygonia interrogationis	
Polygonia comma	Eastern comma
Nymphalis vau-album	Compton tortoiseshell
Nymphalis antiopa	mourning cloak
Nymphalis milberti	Milbert's tortoiseshell
Vanessa atalanta	red admiral
Vanessa virginiensis	American lady
Vanessa cardui	painted lady
Junonia coenia	common buckeye
Limenitis archippus	viceroy
Satyrodes eurydice	eyed brown
Satyrodes appalachia	Appalachian brown
Megisto cymela	little wood-satyr
Coenonympha tullia	common ringlet
Cercyonis pegala	common wood-nymph
Danaus plexippus	monarch

Hesperiidae

Epargyreus clarus	silver-spotted skipper
Thorybes bathyllus	southern cloudywing
Thorybes pylades	northern cloudywing
Erynnis icelus	dreamy duskywing
Erynnis brizo	sleppy duskywing
Erynnis juvenalis	Juvenal's duskywing
Erynnis horatius	Horace's duskywing
Erynnis baptisiae	wild indigo duskywing
Pholisora catullus	common sooty-wing
Carterocephalus palaemon	arctic skipper
Ancyloxypha numitor	least skipper
Thymelicus lineola	European skipper
Hesperia leonardus	Leonard's skipper
Hesperia metea	cobweb skipper
Hesperia sassaacus	Indian skipper
Polites peckius	Peck's skipper
Polites themistocles	tawny-edged skipper
Polites origenes	crossline skipper
Polites mystic	long dash
Wallengrenia egeremet	Northern broken-dash
Pompeius verna	little glassywing
Anatrytone logan	Delaware skipper
Poanes massasoit	mulberry wing
Poanes hobomok	Hobomok skipper
Poanes viator	broad-winged skipper
Euphyes conspicuus	black dash
Euphyes vestris	dun skipper
Artytonopsis hianna	dusted skipper
Amblyscirtes hegon	pepper and salt skipper

Table D-3: Fish of Great Meadows NWR

Scientific Name	Common Name(s)
OSTEICHTHYES (Bony fishes)	
Salmonidae (trouts, whitefishes and graylings)	
Salmo gairdneri	rainbow trout
Salvelinus fontinalis	brook trout
Esocidae (pikes)	
Esox americanus americanus	redfin pickerel
Esox niger	chain pickerel
Esox lucius	northern pike
Cyprinidae (minnows and carps)	
Cyprinus carpio	common carp
Catostomidae (suckers)	
Catostomus commersoni	white sucker
Erimyson oblongus	creek chubsucker
Ictaluridae (freshwater catfishes)	
Ictalurus nebulosus	brown bullhead
Ictalurus punctatus	channel catfish
Anguillidae (freshwater eels)	
Anguilla rostrata	American eel
Centrarchidae (sunfishes)	
Enneacanthus obesus	banded sunfish
Lepomis gibbosus	pumpkinseed
Lepomis macrochirus	bluegill
Micropterus salmoides	largemouth bass
Pomoxis nigromaculatus	black crappie
Percidae (perches)	
Morone americana	white perch
Notemigonus crysoleucas	golden shiner
Perca flavescens	yellow perch

Table D-4: Reptiles of Great Meadows NWR

Scientific Name	Common Name(s)	Status
Testudines		
Chelydridae (Snapping Turtles)		
Chelydra serpentina	common snapping turtle	
Emydidae (Pond Turtles)		
Chrysemys picta	painted turtle	
Clemmys guttata	spotted turtle	SC
Emydoidea blandingii	Blanding's turtle	T
Terrapene carolina	eastern box turtle	SC
Serpentes		

Colubridae (Harmless Snakes)	
Nerodia sipedon	northern water snake
Thamnophis sirtalis	common garter snake

Table D-5: Amphibians of Great Meadows NWR

Scientific Name	Common Name(s)	Status
CAUDATA		
Ambystomatidae (Mole Salamanders)		
Ambystoma laterale	blue-spotted salamander	SC
Ambystoma maculatum	spotted salamander	
Ambystoma opacum	marbled salamander	T
Salamandridae (Newts)		
Notophthlamus viridescens	eastern newt	
Plethodontidae (Lungless Salamanders)		
Desmognathus fuscus fuscus	northern dusky salamander	
Plethodon cinereus	northern redback salamander	
Hemidactylium scutatum	four-toed salamander	SC
Eurycea bislineata	northern two-lined salamander	
ANURA		
Pelobatidae (Spadefoot Toads)		
Scaphiopus holbrookii	eastern spadefoot	T
Bufonidae (True Toads)		
Bufo americanus	American toad	
Hylidae (True Tree Frogs)		
Pseudacccris crucifer	spring peeper	
Hyla versicolor	gray treefrog	
Ranidae (True Frogs)		
Rana catesbeiana	bullfrog	
Rana clamitans	green frog	
Rana palustris	pickerel frog	
Rana pipiens	northern leopard frog	
Rana sylvatica	wood frog	

Table D-6: Mammals of Great Meadows NWR

Scientific Name	Common Name(s)
Didelphidae (New World Opossums)	
Didelphis virginiana	Virginia opossum
Soricidae (Shrews)	
Sorex cinereus	masked shrew
Blarina brevicauda	Northern short-tailed shrew
Talpidae (Moles and Shrew-Moles)	
Parascalops breweri	hairy-tailed mole
Scalopus aquaticus	Eastern mole
Condylura cristata	star-nosed mole

Vespertilionidae (Vesper Bats)

Eptisicus fuscus	big brown bat
Myotis lucifugus	little brown bat

Leporidae (Hares and Rabbits)

Sylvilagus floridanus	Eastern cottontail
Sylvilagus transitionalis	New England cottontail

Sciuridae (Tree Squirrels and Marmots)

Marmota monax	woodchuck
Tamias striatus	Eastern chipmunk
Sciurus carolinensis	Eastern gray squirrel
Tamiasciurus hudsonicus	red Squirrel
Glaucomys sabrinus	Northern flying squirrel
Glaucomys volans	Southern flying squirrel

Castoridae (Beavers)

Castor canadensis	American beaver

Muridae (Mice, Rats, Voles, and Lemmings)

Clethrionomys gapperi	boreal redback vole
Microtus pennsylvanicus	meadow vole
Ondatra zibethicus	muskrat
Peromyscus leucopus	white-footed mouse

Canidae (Dogs, Foxes, and Wolves)

Canis latrans	coyote
Urocyon cinereoargenteus	gray fox
Vulpes vulpes	red fox

Ursidae (Bears)

Ursus americanus	black bear

Procyonidae (Raccoons, Coatis, and Ringtails)

Procyon lotor	raccoon

Mustelidae (Weasels, Minks, Martens, and Otters)

Mustela erminea	short-tailed weasel or ermine
Mustela frenata	long-tailed weasel
Martes pennanti	fisher
Mustela vison	American mink

Mephitidae (Skunks)

Mephitis mephitis	striped skunk

Cervidae (Deer, Elk, and Moose)

Odocoileus virginianus	white-tailed Deer
Alces alces	moose

Other mammals possibly present:

Vespertilionidae (Vesper Bats)

Pipistrellus subflavus	eastern pipistrelle

Muridae (Mice, Rats, Voles, and Lemmings)

Peromyscus maniculatus	deer mouse
Rattus rattus	black rat

Zaporidae (Jumping Mice)
Napaeozapus insignis woodland jumping mouse
Zapus hudsonicus meadow jumping mouse

Erethizontidae (New World Porcupines)
Erethizon dorsatum common porcupine

Mustelidae (Weasels, Minks, Martens, and Otters)
Lontra canadensis Northern river otter

Nomenclature follows Jones, C. et al. (Revised checklist of North American mammals north of Mexico, 1997. Occ. Pap. Mus. Texas Tech. Univ. 173:1-21, 1997).

Table D-7: Plants of Great Meadows NWR

Scientific Name	Common Name(s)
PTERIDOPHYTES (Fern and Fern Allies)	
Dennstaedtiaceae	
Pteridium aqualinum	bracken fern
Dryopteridaceae	
Onoclea sensibilis	sensitive fern
Lycopodiaceae	
Lycopodium spp.	clubmoss
Osmundaceae	
Osmunda cinnamomea	cinnamon fern
Osmunda regalis	royal fern
Thelypteridaceae	
Thelypteris novaboracensis	New York fern
Thelypteris palustris	marsh fern
GYMNOSPERMS (Cone-bearing Plants)	
Pinaceae	
Pinus strobus	white pine
ANGIOSPERMS	
Dicotyledons (Flowering Plants)	
Aceraceae	
Acer rubrum	red maple
Acer saccharinum	silver maple
Anacardiaceae	
Toxicodendron radicans	poison ivy
Apiaceae	
Peucedanum palustre	milk parsley
Aquifoliaceae	
Ilex verticilatta	common winterberry
Asclepiadaceae	

Asclepias incarnata	swamp milkweed

Asteraceae

Achillea millefolium	yarrow
Ambrosia artemisifolia	ragweed
Artemisia vulgaris	common mugwort
Aster acuminatus	whorled aster
Aster vimineus	small white aster
Aster puniceus	purple-stemmed aster
Bidens cernua	nodding bur marigold
Bidens frondosa	sticktights
Erichtites hieracifolia	pilewort
Erigeron annus	daisy-fleabane or whitetop
Erigeron canadensis	horseweed
Eupatorium dubium	eastern Joe-pye weed
Euthania graminifolia	grass-leaved goldenrod
Prenathes trifoliata	fall rattlesnake-root
Solidago rugosa	rough-leaved goldenrod

Balsaminaceae

Impatiens capensis	orange jewelweed
Berberis thunbergii	Japanese barberry

Betulaceae

Alnus incana var americana	speckled alder
Betula papyrifera	white birch
Betula populifolia	gray birch
Carpinus caroliniana	ironwood
Corylus cornuta	beaked hazelnut
Cardamine pratensis	cuckoo flower

Brassicaceae

Rorippa palustris var islandica	marsh yellowcress

Campanulaceae

Lobelia cardinalis	cardinal flower

Caprifoliaceae

Lonicera morrowi	morrow honeysuckle
Sambucus canadensis	common elderberry
Viburnum dentatum var lucidum	northern or smotth arrowood

Celastraceae

Celastrus orbiculata	Oriental bittersweet
Euonymus alatus	winged euonymus

Chenopodiaceae

Chenopodium albus	pigweed

Clethraceae

Clethra alnifolia	sweet pepperbush

Convovulaceae

Calystegia sepia	hedge bindweed

Cornaceae

Cornus amomum	swamp dogwood

Cuscutaceae	
Cuscuta gronovii	swamp dodder
Ericaceae	
Kalmia angustifolia	sheep laurel
Rhododendron viscosum	swamp azalea
Vaccinium angustifolia	low-bush blueberry
Vaccinium corymbosum	high-bush blueberry
Fabaceae	
Desmodium paniculatum	panicled tick-trefoil
Trifolium arvense	rabbit's foot clover
Trifolium pratense	red clover
Trifolium repens	white clover
Fagaceae	
Castanea dentata	American chestnut
Quercus alba	white oak
Quercus bicolor	swamp white oak
Quercus rubra	red oak
Grossulariaceae	
Ribes sativum	garden red currant
Juglandaceae	
Carya spp.	hickory
Lamiaceae	
Lycopus virginicus	bugleweed
Lythraceae	
Lythrum salicaria	purple loosestrife
Myricaceae	
Myrica gale	sweet gale
Nelumbonaceae	
Nelumbo lutea	American lotus
Nyssaceae	
Nyssa sylvatica	tupelo
Onagraceae	
Oenothera biennis	evening primrose
Oxalidaceae	
Oxalis stricta	common yellow wood-sorrel
Papaveraceae	
Chelidonium majus	celandine
Phytolaccaaceae	
Phytolacca americana	pokeweed
Plantaginaceae	
Plantago major	common plantain
Polygonaceae	
Polygonum arifolium	halberd-leaf tearthumb
Polygonum hydropiper	water pepper

Polygonum persicaria	lady's thumb
Polygonum sagittatum	arrow-leaved tearthumb
Polygonum scandens	climbing false buckwheat
Rumex acetosella	sheep- or red laurel
Rumex crispus	curly dock
Primulaceae	
Lysimachia terestris	swamp candles
Trientalis borealis	starflower
Pryrolaceae	
Chimaphila maculata	striped pipissewa
Ranunculaceae	
Anemone quinquefolia	wood-anemone
Thalictrum pubescens	tall meadow-rue
Rhamnaceae	
Rhamnus alnifolia	glossy buckthorn
Rosaceae	
Fragaria virginiana	wild strawberry
Geum spp.	avens
Malus sieboldii	Toringo crabapple
Malus spp.	crabapple
Potentilla norvegica	rough cinquefoil
Prunus serotina	black cherry
Rosa multiflora	multiflora rose
Rubus allegheniensis	common blackberry
Rubus hispidus	swamp dewberry
Rubus occidentalis	black raspberry
Sorbus aucuparia	European mountain-ash
Spiraea alba var latifolia	meadowsweet
Rubiaceae	
Cephalanthus occidentalis	buttonbush
Galium palustre	marsh bedstraw
Salicaceae	
Populus deltoides	cottonwood
Populus grandidentata	bigtooth aspen
Populus tremuloides	quaking aspen
Salix spp.	willow
Scrophulariaceae	
Agalinus tenuifolia	slender gerardia
Trapaceae	
Trapa natans	water chestnut
Ulmaceae	
Ulmus americana	American elm
Urticaceae	
Boehmeria cylindrica	false nettle
Verbenaceae	
Verbena hastata	blue vervain

Violaceae	
Viola brittoniana	Britton's voilet
Vitaceae	
Parthenocissus quinquefolia	Virginia creeper or woodbine
Vitis labrusca	fox grape
MONOCTYLEDONS (Flowering Plants)	
Acoraceae	
Acorus americanus	sweet flag
Alismataceae	
Sagittaria latifolia	common arrowhead
Araceae	
Peltandra virginica	arrow arum
Symplocarpus foetidus	skunk cabbage
Cyperaceae	
Carex crinata	awned or fringed sedge
Carex scoparia	broom-sedge
Carex stricta	tussock-sedge
Cyperus strigosus	big straw-colored flatsedge
Scirpus fluviatalis	river-bullsedge or -bulrush
Lemnaceae	
Lemna sp.	duckweed
Wolffia spp.	wolffia
Liliaceae	
Maianthemum canadense	Canada mayflower
Medeola virginaina	Indian cucumber root
Uvularia sessifolia	wild oats
Poaceae	
Phragmites australis	common reed
Spartina pectinata	freshwater cord-grass
Zizania aquatica	wild rice
Pontedariaceae	
Pontedaria cordata	pickerel-weed
Smilacaceae	
Smilax rotundifolia	common greenbriar
Sparganiaceae	
Sparganium eurycarpum	giant or broad-fruited bur-reed
Typhaceae	
Typha angustifolia	narrow-leaved cattail
Typha latifolia	broad-leaved cattail

Appendix E: RONS and MMS

The Refuge Operations Needs System (RONS) lists refuge projects over $20,000. The Management Maintenance System (MMS) identifies maintenace needs on refuges. Projects on both lists are prioritized and initated as funding becomes available. Funding is allocated through the Service's Northeast Regional Office and is based on Congressional appropriation to the service.

Project: this list includes projects currently in the RONS database and projects proposed in the CCP.

FTE: full time staffing equivalent. One fte equals one person working full time for one whole year; seasonal employees are considered 0.5 fte. (note: staff are often "shared" by multiple rons projects)

Cost, year 1: estimated costs incurred during the first year of a project - typically higher than recurring costs, due to construction, equipment purchase, or other start-up expenses.

Cost, recurring: estimated average annual project cost for subsequent years; includes recurring salary and maintenance costs.

Project duration: estimated length of time for each project. Since this CCP will be revised in 15 years, the "maximum project duration" is 15 years, even though some projects may continue into the next planning cycle

Table E-1: Projects currently in the RONS database and proposed projects to be included for Great Meadows NWR

Project	FTE	Starup Cost x 1,000	Recurring Cost x 1,000	Duration (Years)
Refuge oversight and partnership development	GS 12 Manager	145	80	15
Water chestnut control		72	20	15
Restore drained wetlands		88	5	15
Manage habitat (planning, monitoring, and inventory)	GS 1 Biol., GS 5 Biotech (seasonal)	150	80	15
Effects of low flying airplanes		70	5	5
Survey of mussels on a Wild and Scenic River		48	8	4
Implement sound wildlife management practices		58	8	3
Restoring native plants and wildlife		73	8	10
Conduct reptile, invertebrate, and amphibian surveys on the Wild and Scenic River		55	10	3

Project	**FTE**	**Starup Cost x 1,000**	**Recurring Cost x 1,000**	**Duration (Years)**
Grassland/Old field restoration and management		98	8	15
Collect baseline data and develop inventory plans	GS 7 Biotech	114	49	15
Implement an urban environmental education program		55	15	15
Provide accessible wildlife-dependent recreation opportunities & interpretation		86	5	15
Improve public use infrastructure including trails system, construction of observation platforms & photo blinds	WG 8 Maint. Worker	118	53	15
Develop wildlife demonstration and educational curriculum	GS 9 Interpreter	123	58	15
Improve refuge pamphlets, trail guides, species checklists, viewing guides, & other literature		10	10	15
Enhance public service capabilities – provide planning and data management in support of visitor services	GS 5 Office assistant	107	42	15
Maintenance at new Visitor Contact Station at highest public use area (Concord)	WG 3 Maint. Worker	110	45	15
Increase biological & public outreach through expanded volunteer program		0	7	15
Enhance Volunteer Program Coordination	GS 11 Volunteer Coordinator	133	68	15
Develop Boston Airport Outreach Materials		92	13	15
Conduct public use impact study		92	5	10
Interpret Wild & Scenic River through brochures, kiosk, and new programs		70	15	15
Conduct cultural resources investigation		40	5	3
Protect museum artifacts		77	5	15
Educate MA residents – Equip and operate new visitor center	GS 11 Educator GS 7 & GS 5 Interpreter WG 6	459	209	15

Project	FTE	Starup Cost x 1,000	Recurring Cost x 1,000	Duration (Years)
	Maintenance			
Enhance protection of refuge property		44	3	15
Manage public use	GS 7 (LE) Park Ranger	114	49	15
Boundary identification and protection		45	5	15
Total		**2,746**	**893**	

Table E-2: Projects currently backlogged in the MMS for Great Meadows NWR

Project # (SAMMS)	Project Name	Cost Estimate ($1,000)
99124632	Headquarters elevator	313
02120843	Replace Concord shop	125
02120864	Rehab Headquarters shop	131
03126424	Replace O'Rourke Barn	398
98104380	Rehab Concord dike 1'	211
98104390	Replace Concord gates	31
93104381	VCS Exhibits I	158
03126442	Replace O'Rourke shed	104
99104376	VCS Exhibits II	165
00104410	HQ doors	43
98104392	Replace Concord observation blind	31
00104408	Repair Strand dike	50
98104400	Sudbury kiosks	26
99120871	Rehab HQ II	350
99124630	Rehab HQ III	210
04130509	HQ carpet	49
04130510	HQ windows	55
04133018	HQ deck and ramp	89
11014413	Replace grader	181
00104414	Replace 2640 tractor	71
00104411	Replace 550 bulldozer	186
00105216	Replace lowboy trailer	78
01113923	Replace tractor loader	75
00104416	Replace tractor trailer	78
99104365	Replace 8' mower	9
01111815	Replace 97 Caravan	29
01111827	Replace 96 Ford Ranger	22
01111819	Replace 98 Ford Explorer	29
01111818	Replace 98 Taurus Wagon	28
01111821	Replace 99 Dodge Pickup	28

Project # (SAMMS)	Project Name	Cost Estimate ($1,000)
01111829	Replace 99 Ranger Pickup	22
01111824	Replace 00 ¾ ton Dodge Pickup	27
01113945	Replace 18' Jon Boat	9
01113064	Replace woodchipper	20
98110307	Concord Visitor contact station	1,357
98	Two automatic gates	50
98	Construct accessible fishing pier	95
02120850	Replace quarters I	750
00104420	Ditch cleaning	383
Total		**6,066**

Table E-3: Projects currently backlogged in the MMS for the Eastern Massachusetts Refuge Complex

Project # (SAMMS)	Project Name	Cost Estimate ($1,000)
01113926	Replace 1979 tractor trailer	55
99104362	Replace 1992 S-10	32
99104364	Replace 1991 Suburban	37
00104409	Replace 17' aluminum boat	27
00104417	Replace 23' Sea Ox	42
00104412	Replace Boston Whaler	26
01111811	Replace 00 Suburban	40
01111813	Replace 00 Durango	37
02120884	Replace 01 1-ton pickup	42
02120936	Replace 19' Carolina skiff	29
02120939	Replace 02 crew cab pickup	28
02120942	Replace 01 ½ ton pickup	25
00110311	Visitor center phase I	522
00110344	Visitor center phase II	908
00110539	Visitor center phase III	5,386
Total		**7,026**

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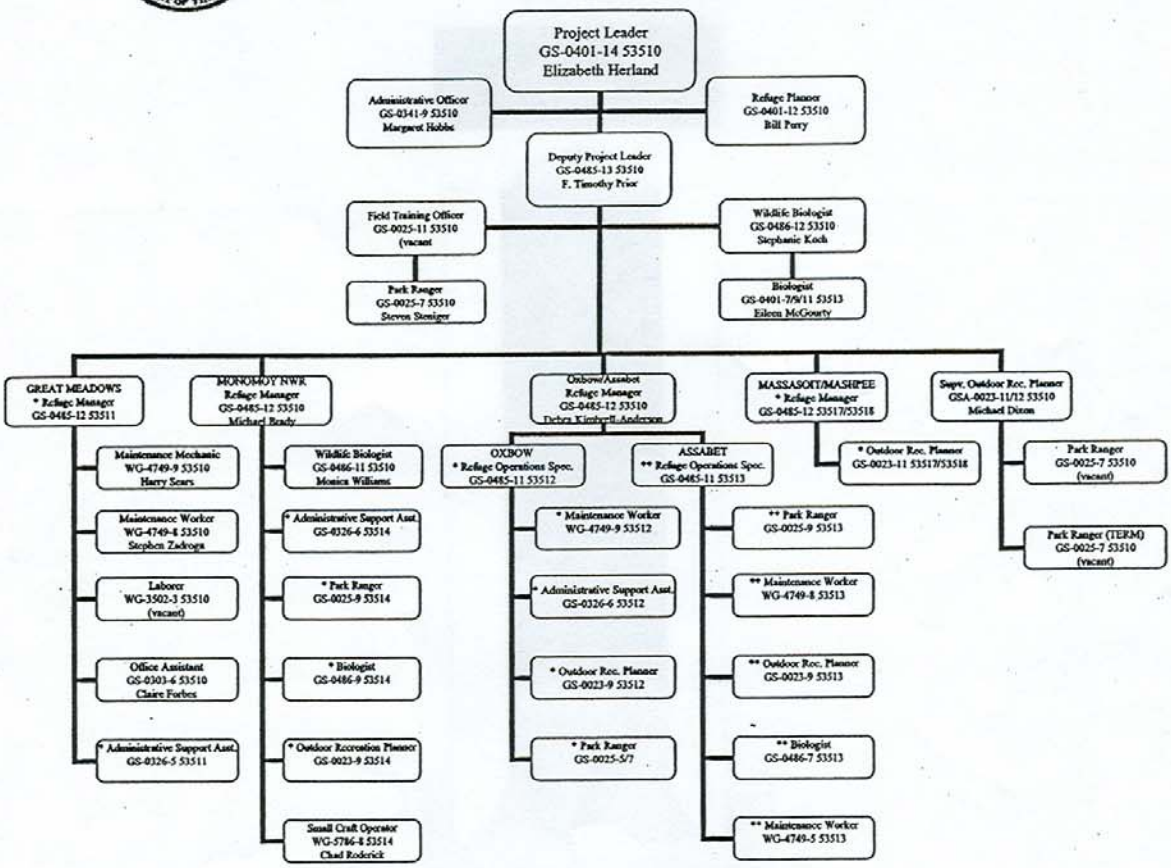
Appendix F: Eastern Massachusetts National Wildlife Refuge Complex Staffing Chart

U.S. Fish and Wildlife Service
Northeast Region
Regional Chief, National Wildlife Refuge System
Eastern Massachusetts National Wildlife Refuge Complex
(Assabet River/Great Meadows/Mashpee/Massasoit/Monomoy/Nantucket/Nomans Land Island/Oxbow)



Elizabeth A Herland 12/16/04
Refuge Manager Date

Richard W Dyer 11/2/04
Refuge Supervisor Date

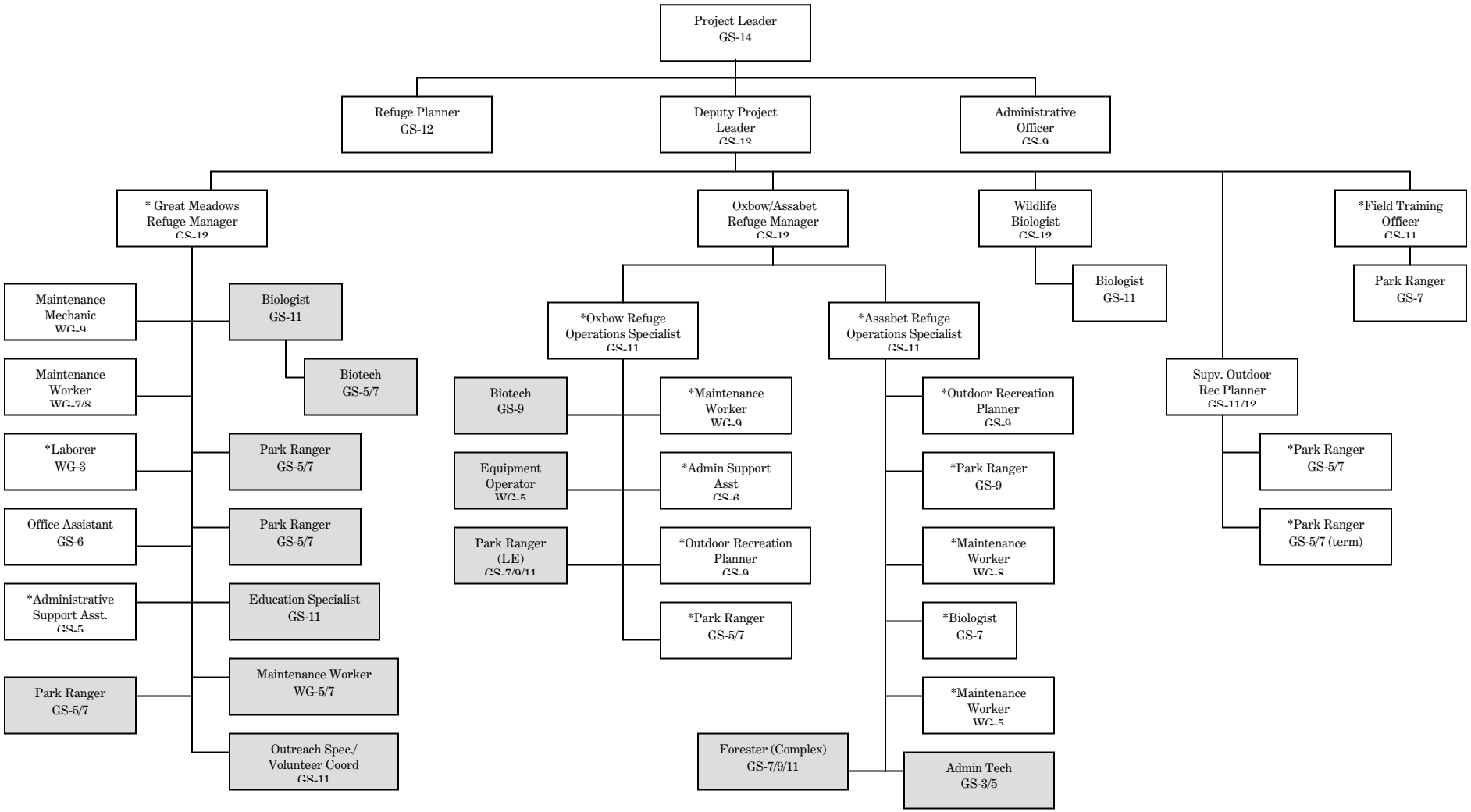
Courtney D Feger 11/3/2004
Regional Chief, NWRS Date

Regional Director Date 11-12-04

* Essential Staff

** New/Expanded Staff

Eastern Massachusetts National Wildlife Refuge Complex
Assabet River, Great Meadows, and Oxbow National Wildlife Refuges
Proposed Staffing Chart



Highlighted boxes show proposed positions.
This chart does not depict additional staff for Mashpee, Massasoit, Monomoy, Nomans Land Island, and Nantucket NWRs
* Positions that are currently vacant.

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Appendix G: Final Compatibility Determinations

Compatibility Determination

Use: Environmental Education and Interpretation

Refuge Name: Great Meadows National Wildlife Refuges

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3,1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1)
Great Meadows purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Environmental education includes activities which seek to increase public knowledge and understanding of wildlife and the importance of habitat protection and management. Typical activities include teacher or staff-guided on-site field trips, off-site programs in classrooms, and nature study, such as teacher and student workshops and curriculum-structured instruction, and interpretation of wildlife resources. The refuge also supports an Urban Education program which offers these programs to students from the Boston and Worcester schools.

Interpretation includes those activities and supporting infrastructure that explain management activities, fish and wildlife resources, ecological processes, and cultural history among other topics to public users. Programs and activities may be developed, sponsored and supervised by volunteers.

Access to the refuge for these activities is achieved through walking, snowshoeing or cross-country skiing.

On and off site environmental education programs and interpretive programs, assistance with teacher workshops, and informational kiosks would be offered at Great Meadows NWR. The proposed action also includes interpretive materials on the trails. A visitor contact station would be built to support refuge programs.

Availability of Resources: Environmental education and interpretation occur through the use of existing staff, resources, and facilities. Existing resources include staff, interpretive kiosks and displays, environmental education programs carried out through extensive help of volunteers, displays, and trails. The amount and character of environmental and interpretive programming will be a direct reflection of the refuge's staff and funding levels. The following components of an

environmental education and interpretation program will need to be developed to fully implement the program outlined in the Comprehensive Conservation Plan. Additional components may be added at later dates. Specific costs will be determined as implementation of specific programs occurs.

- Expand Urban Education
- Develop wildlife demonstration and educational curriculum
- Interpretive brochures (trail guides, pamphlets, species lists, etc.)
- Staff new visitor contact station at Concord
- Visitor center for Complex- equipment and operation of the new center
- Interpret Wild and Scenic River through brochures, kiosks and new programs

Anticipated Impacts of the Use: On-site activities by teachers and students using trails and environmental education sites may impose low-level impacts such as trampling of vegetation, removing vegetation, littering and temporary disturbance to wildlife. In the event of persistent disturbance to habitat or wildlife the activity will be restricted or discontinued.

Placement of kiosks may impact small areas of vegetation. Kiosks will be placed where minimal disturbance will occur.

Providing additional interpretive and educational brochures and materials may result in increased knowledge of the refuge and its resources. This awareness and knowledge may improve the willingness of the public to support refuge programs, resources, and compliance with regulations.

There will be impacts from building a new visitor contact station. These impacts will be analyzed in an appropriate NEPA compliant environmental document after the sites for the buildings are determined.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility: Activities will be held in areas where minimal impact will occur. Periodic evaluation of sites and programs will be conducted to assess if objectives are being met and to prevent site degradation. If evidence of unacceptable adverse impacts appear, the location(s) of activities will be rotated with secondary sites, curtailed or discontinued. The known presence of a threatened or endangered species will preclude the use of an area until the Refuge Manager determines otherwise.

Special use permits will be issued to organizations conducting environmental education or interpretive tours or activities. A fee may be charged for the special use permit. The areas used by such tours will be closely monitored to evaluate the impacts on the resource; if adverse impacts appear, the activity will be moved to secondary locations or curtailed or discontinued. Specific

conditions may apply depending upon the requested activity and will be addressed through the special use permit.

Guidelines to ensure the safety of all participants will be issued in writing to the teacher or group leader responsible for the activities and will be reviewed before the activity begins.

Law enforcement patrol of public use areas should continue to minimize the above-mentioned types of violations. The current "Refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Environmental education and interpretation activities generally support Refuge purposes and impacts can largely be minimized (Goff et al., 1988). The minor resource impacts attributed to these activities are generally outweighed by the benefits gained by educating present and future generations about refuge resources. Environmental education is a public use management tool used to develop a resource protection ethic within society. While it targets school age children, it is not limited to this group. This tool allows us to educate refuge visitors about endangered and threatened species management, wildlife management and ecological principles and communities. A secondary benefit of environmental education is that it instills an 'ownership' or 'stewardship' ethic in visitors and most likely reduces vandalism, littering and poaching; it also strengthens Service visibility in the local community. Environmental education (outdoor classroom) is listed in the Refuge Manual (U.S. Fish and Wildlife Service, 1985) as the highest priority visitor use activity throughout the National Wildlife Refuge System.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 15-year Reevaluation Date: December 27, 2019

Compatibility Determination

Use: Fishing

Refuge Name: Great Meadows National Wildlife Refuge

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3,1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes: Great Meadows purposes are

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Fishing activities include: shore or bank fishing, and fishing from a boat or canoe. Access to the refuge for this activity is achieved through walking, snowshoeing, cross-country skiing, or by canoe. Fishing opportunities at Great Meadows Refuge include both shore and bank fishing. Refuge pools are not open to fishing. Any applicable State fishing licenses are required. This use is a priority public use

Availability of Resources: Costs for this activity are small. Costs which may occur include maintenance costs to trails and access roads as well as law enforcement personnel costs. The proposed action includes hiring additional law enforcement staff that would be assisting with monitoring these programs.

Costs which may occur include maintenance costs to trails and access roads as well as law enforcement personnel costs. The Proposed Action includes hiring a law enforcement officer support wildlife dependent recreation. Additionally the urban education program includes fishing opportunities which also requires interpretive staff time and assistance

Anticipated Impacts on Refuge Purpose: The designated areas for fishing may need stabilization to prevent erosion before being opened and or to curb erosion after use of these areas has begun. Potential and actual refuge impacts include trampling vegetation, creation of unauthorized trails and subsequent erosion or over-harvesting. Some disturbance of roosting and feeding birds will probably occur (Burger, 1981) but is considered minimal. Discarded fishing line and other fishing litter can entangle migratory birds and cause injury and death (Gregory, 1991). Additionally, litter impacts the visual experience of refuge visitors (Marion and Lime, 1986). Anticipated law enforcement issues include illegal taking of fish, littering, illegal fires at night, fishing without a license, and disorderly conduct.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility:
The designated areas for fishing may need stabilization to prevent erosion before being opened and or to curb erosion after use of these areas has begun. Adequate funding to provide seasonal law enforcement presence at night will be required during the peak fishing season (April through October).

Enforcement will help to curb illegal fires, disorderly conduct and littering. Enforcement will also help to ensure that fishing regulations are observed, reduce creation of unauthorized trails and serve as a direct contact to the fishing public. Public meetings with local fishing clubs and interested parties will also be required to reinforce refuge regulations. If these measures do not curb unauthorized activities, other measures will be implemented to control activities and fishermen. Law enforcement patrol of public use areas should minimize the above-mentioned types of violations. The current "Refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; fishing, environmental education, interpretation, hunting, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Fishing is a wildlife-oriented activity that provides substantial recreational opportunities to the public (U.S. Fish and Wildlife Service, 1992 and U.S. Fish and Wildlife Service, 1997). Fishing is a traditional form of outdoor recreation.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 15-year Reevaluation Date: December 27, 2019

Compatibility Determination

Use: Hunting - White-tailed Deer Hunting , Waterfowl Hunting

Refuge Name: Great Meadows National Wildlife Refuges

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3,1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1)

Refuge Purposes: Great Meadows NWR purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

White-tail deer

Archery would be the only acceptable means of taking deer on Great Meadows NWR. Only portable stands are allowed and no tree spiking is allowed. Open seasons will adhere to Massachusetts State deer hunting regulations. Access to the refuge for this activity is achieved through walking, snowshoeing or cross-country skiing.

Waterfowl Hunting

Waterfowl hunting involves the use of calls and decoys to bring in waterfowl. Dogs and canoes may be used in areas to retrieve downed birds. No permanent blinds are allowed. Waterfowl hunting activities will be conducted according to State regulations and restrictions.

Several areas of Great Meadows Refuge will be opened to hunting of waterfowl, including areas on the Sudbury and Concord Rivers and associated wetlands.

All applicable Federal (50 CFR Part 32) and State hunting regulations will be in force on the refuge, including the discharge of firearms or arrows across or within 150 feet of any highway and the possession or discharge of any firearm or arrow within 500 feet of any dwelling or building in use. The use or possession of alcoholic beverages while hunting will be strictly prohibited. Hunting will occur within designated State seasons but could be restricted by time or day if determined necessary by the Refuge Manager to address resource or visitor use issues. All hunters will be required to obtain a permit from the refuge prior to scouting or hunting. The

permit could contain both refuge-specific information, maps, and/or additional refuge requirements for hunter compliance. This may be modified on an annual basis if necessary. A fee will be charged for the permit.

Access to the refuge for all hunt seasons is through walking or snowshoeing. Cutting of vegetation is prohibited.

Limited special seasons will be provided for physically handicapped hunters. Selected roads on the refuge will remain open for restricted vehicle traffic. Some of these roads will allow us to provide handicapped accessible hunting opportunities.

Availability of Resources: See Appendix F of the Final CCP for recurring cost estimates and duration of the proposed projects.

The costs involved in offering this wildlife dependent activity are minimal. Hunting on the refuge will be by annual permit. The refuge will be collecting an annual fee of $20 for all hunting seasons on the refuge. One fee is valid for Assabet River, Great Meadows, and Oxbow NWRs for the seasons that each type of hunting is allowed. Fee money collected will help recover costs for funding the program.

Anticipated Impacts on Refuge Purpose: The impacts of allowing hunting may include disturbance of non-target species in the course of tracking deer, trampling of vegetation, possible creation of unauthorized trails by hunters, littering and possible vandalism and subsequent erosion.

White-tailed deer number about 90,000 in Massachusetts. In some areas, deer density is as high as 25-30 deer per square mile. Many landowners suffer landscape damage due to deer on a regular basis, transmission of Lyme disease becomes a significant issue with large numbers of deer, starvation is a possibility when deer numbers are high as food supplies dwindle in bad weather and deer-vehicle collisions become more common and problematic.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility:

- All hunters must obtain all necessary State, Federal, and refuge permits.
- Hunters must abide by all applicable refuge, State, and Federal regulations.
- Refuge staff will develop a Hunt Plan and amend the Code of Federal Regulations before permitting hunting on the refuge.

- Staff will monitor hunting activities to determine any adverse impacts to refuge resources and adjust the hunt program as necessary.

- Waterfowl hunting is permitted from motorized and non-motorized boats (boat must not be under power) on the Sudbury River and from the banks of the River over River waters. Enforcement will be necessary to ensure compliance with refuge and State regulations regarding hunting of waterfowl. Cutting of vegetation is prohibited. The use of unleashed dogs is permitted only while under the control of individuals actively engaged in hunting.

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; hunting, environmental education, interpretation, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Hunting of white-tailed deer and waterfowl on Great Meadows NWR is justified within refuge objectives by providing wildlife-oriented recreation and promoting appreciation of wildlife and the outdoors. Recreational hunting is also a valid means of population control and can serve to keep wildlife populations in check.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 15-year Reevaluation Date: December 27, 2019

Compatibility Determination

Use: Jogging/Running

Refuge Name: Great Meadows National Wildlife Refuge

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3, 1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Jogging or running on refuge trails. Maps showing these trail systems are included in Refuge Brochures for Great Meadows NWR. Jogging occurs year-round on the refuges with the majority of use from April through October along the Dike Trail at the Concord impoundments. Occasionally, joggers stop at the informational kiosk to obtain refuge or wildlife viewing information. Use is heaviest during the summer months and occurs more frequently early in the morning and in the evening when individuals jog before and after work and while the weather is more pleasant. Visual observations indicate that total use is moderate to heavy, but exact numbers are currently not available. The activity is primarily athletic in nature. It is likely that some joggers observe wildlife while they are jogging on the refuge. However, such observation tends to be incidental to the primary activity of jogging. At Great Meadows NWR, joggers include individuals and couples as well as larger groups such as track teams from local schools and a local running club. Track teams tend to jog in the afternoons and local clubs run on weekend mornings.

Availability of Resources: Maintenance of the trails and facilities include costs. These costs are not directly related to jogging or running. Jogging and running may cause incremental needs for additional trail maintenance activities. The major portion of the funds needed to support this activity is in the form of salaries to maintain the trails and to provide protection and monitoring; additional funds are needed for maintenance materials and other supplies. The prorated portion of cost to maintain the trails is estimated to be $5,000 and the prorated portion of the cost for law enforcement, resource protection and monitoring is approximately $3,000.

Anticipated Impacts on Refuge Purpose: Jogging or running as conducted on Great Meadows NWR has not been studied in a rigorous fashion. Jogging has the potential of impacting shorebird, waterfowl, marshbirds and other migratory bird populations feeding and resting near

the trails during certain times of the year. Dense foraging habitat often is concentrated along the edges of the impoundments where water levels are lower, and therefore attracts large numbers of foraging ducks and shorebirds during migration. Use of upland trails is more likely to impact songbirds than other migratory birds. Human disturbance to migratory birds has been documented in many studies in different locations.

Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Korschgen et al 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. The location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller, 1998). In addition, Burger (1981) found that wading birds were extremely sensitive to disturbance in the northeastern U.S. In regard to waterfowl, Klein (1989) found migratory dabbling ducks to be the most sensitive to disturbance and migrant ducks to be more sensitive when they first arrived, in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species.

For songbirds, Gutzwiller et. al. (1997) found that singing behavior of some species was altered by low levels of human intrusion. Jogging can impact normal behavioral activities, including feeding, reproductive, and social behavior. Studies have shown that ducks and shorebirds are sensitive to jogging activity (Burger 1981, 1986). Resident waterbirds tend to be less sensitive to human disturbance than migrants, and migrant ducks are particularly sensitive when they first arrive (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Public Review and Comment: The public review and comment period was announced on refuge kiosks, in a planning update sent to all of the individuals on the CCP mailing list, and on the refuge website. The comment period was from June 21, 2004 to July 20, 2004. We received no comments on this compatibility determination.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility: Joggers and runners will utilize only established trails and other areas open to the public and not venture into closed areas. The current "refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

We will be undertaking research to examine whether or not there are site specific impacts on the refuges. We will examine impacts to wildlife and impacts to other recreationists participating in wildlife dependent recreational activities. We will reexamine the compatibility of jogging and

running after this research is completed.

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Jogging and running are to be used only as a means to facilitate the priority public uses identified above.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Literature Cited:

Belanger, L., and J. Bedard. 1990. *Energetic cost of man-induced disturbance to staging snow geese*. Journal of Wildlife Management. 54:36-

Boyle, S. A., F. B. Samson. 1985. *Effects of nonconsumptive recreation on wildlife: A review*. Wildlife Society Bulletin 13:110-

Burger, J. 1981. *The effect of human activity on birds at a coastal bay*. Biological Conservation. 21:231-241.

Burger, J. 1986. *The effect of human activity on shorebirds in two coastal bays in northeastern United States*. Environmental Conservation. 13:123-130.

Erwin, R. M. 1980. *Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance*. Biological Conservation. 18:39-51.

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, 1997. *Does human intrusion alter the seasonal timing of avian song during breeding periods?* Auk 114:55-65.

Havera, S. P., L. R. Boens, M. M. Georgi, and R. T. Shealy. 1992. *Human disturbance of waterfowl on Keokuk Pool, Mississippi River*. Wildlife Society Bulletin. 20:290-298.

Henson, P. T., and A. Grant. 1991. *The effects of human disturbance on trumpeter swan breeding behavior*. Wildlife Society Bulletin. 19:248-257.

Kahl, R. 1991. *Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin*. Wildlife Society Bulletin. 19:242-248.

Klein, M.L. 1993. *Waterbird behavioral responses to human disturbances*. Wildlife Society Bulletin. 21:31-39.

Korschen, C. E., L. S. George, and W. L. Green. 1985. *Disturbance of diving ducks by boaters on*

a migrational staging area. Wildlife Society Bulletin. 13:290-296.

McNeil, Raymond; Pierre Drapeau; John D. Goss-Custard. 1992. *The occurrence and adaptive significance of nocturnal habitats in waterfowl.* Biological Review. 67: 381-419

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. *Influence of recreational trails on breeding bird communities*. Ecological Applications. 8(1) 162-169.

Morton, J. M., A. C. Fowler, and R. L. Kirkpatrick. 1989. *Time and energy budgets of American black ducks in winter*. Journal of Wildlife Management. 53:401-410.

Owen, M. 1973. *The management of grassland areas for wintering geese.* Wildfowl. 24:123-130.

Ward, D. H., and R. A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.

Williams, G. J., and E. Forbes. 1980. *The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management*. Wildfowl. 31:151-157.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 5-year Reevaluation Date: December 27, 2009

Compatibility Determination

Use: Motorized Boating

Refuge Name: Great Meadows National Wildlife Refuge

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3, 1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for — incidental fish and wildlife-oriented recreational development,"
- (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

(a) What is the use? Is the use a priority public use?
The use is motorized boats on certain refuge waters. Use of motorized boats is not a priority public use, but would be utilized in support of the priority public uses of fishing, waterfowl hunting, and wildlife observation and photography. Motorized boats does not include jet skis.

(b) Where would the use be conducted?
Motorboating would occur only on the Concord and Sudbury Rivers within and adjacent to the refuge boundary. Motorboating will not be allowed in refuge pools or wetlands.

(c) When would the use be conducted?
Use of motorized boats will occur primarily during the spring, summer, and fall. Use of motorized boats will be precluded during times when the river is frozen.

(d) How would the use be conducted?
Individuals will launch boats from a variety of formal and informal locations along the river. They will travel up and down the river on and off of refuge waters to participate in wildlife dependent activities.

(e) Why is this use being proposed?
Use of motorized boats at Great Meadows NWR will facilitate wildlife observation, waterfowl hunting, photography, and fishing.

Availability of Resources: The costs of facilities associated with facilitating motorized boating are discussed under the compatibility determinations for the respective wildlife dependent public uses. These costs are also included in Appendix E of the Comprehensive Conservation Plan (CCP) for Great Meadows NWR. Facilities at Great Meadows NWR would not be used.

Anticipated Impacts on Refuge Purpose:

Use of motorized boats at Great Meadows NWR will be monitored to ensure the activity will not have adverse impact on wildlife habitat, or the management of migratory birds and other wildlife species. There is potential for wildlife disturbance due to noise of boat motors, proximity of boats to wildlife, speed of boats, and time of operation. This activity will facilitate wildlife-dependent recreation.

Public Review and Comment: The public review and comment period was announced on refuge kiosks, in a planning update sent to all of the individuals on the CCP mailing list, and on the refuge website. The comment period was from June 21, 2004 to July 20, 2004.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility: The Code of Federal Regulations (CFR) allows refuge managers to authorize the use of boats in national wildlife refuges. The use of motorized boats could adversely impact waterfowl and resident wildlife if guidelines are not in place to ensure operation to minimize such impacts.

Historically, use of motorized boats has occurred up and down the Concord and Sudbury Rivers and the refuge is just one of the many landowners along the rivers. We have the responsibility of ensuring that all of the activities that take place within the refuge occur in a manner that is consistent with the purposes of the refuge. As such, we will review all of the areas of the rivers within and adjacent to the refuge and determine the maximum allowable speed. In no case will the speed limit exceed 25 miles per hour. We will review additional speed restrictions imposed by the towns that border or encompass the rivers and will respect any speed limits that are in place.

All of the provisions of 50 CFR §27.31 and 27.32 will be imposed as well. Included in this section is the requirement that "No operator or person in charge of any boat shall operate or knowingly permit any other person to operate a boat in a reckless manner, or in a manner so as to endanger or be likely to endanger any person, property or wildlife."

Boaters will utilize only areas open to the public and not venture into closed areas. We do not provide areas for boat landing and access to the refuge lands from the river. Boaters are not allowed to tie off to shoreline vegetation or pull onto refuge lands to access trails.

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to

be compatible, they are to receive enhanced consideration over other uses in planning and management.

Use of motorized boats is to be used as a means to facilitate the priority public uses identified above.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/27/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/28/2004
(Signature and Date)

Mandatory 10-year Reevaluation Date: December 28, 2014

Compatibility Determination

Use: Natural History Tours

Refuge Names: Great Meadows National Wildlife Refuge

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3,1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes: Great Meadows purposes are

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

(a) What is the use? Is the use a priority public use?
This activity consists of a group of people with a leader or guide walking or driving on refuge property to learn a bout plant and wildlife species, natural processes and wetlands. Natural history tours will facilitate wildlife observation and photography, and environmental interpretation and education, which are priority uses of the refuge.

(b) Where would the use be conducted?
Natural history tours would occur only on established refuge trails or roads.

(c) When would the use be conducted?
Natural history tours would be conducted only during hours when the refuge is open, generally ½ hour before sunrise to ½ hour after sunset.

(d) How would the use be conducted?
Natural history tours would occur either by foot or motor vehicle.

(e) Why is this use being proposed?
Natural history tours offer an opportunity to expose visitors to the Refuge purposes and Refuge System Mission. Some of the tours may also be birding trips. Participants gain an extra understanding and appreciation for the Refuge and the environment.

Availability of Resources: Before groups may conduct tours on the refuge they must obtain a special use permit. The cost of preparing the special use permits Natural History Tours will be minimal. Maintenance of the trails and facilities will also include costs.

Anticipated Impacts on Refuge Purpose: The impacts associated with this activity are trampling of vegetation, littering, possible vandalism and temporary disturbance to wildlife in the area of the group. These impacts are minor in light of the appreciation and knowledge gained by participants in these activities. The known presence of a threatened or endangered species will preclude the use of an area until the Refuge Manager determines otherwise.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility: Special use permits will be issued to the organization conducting the tours. A fee may be charged for the special use permit. The areas used by such tours will be closely monitored to evaluate the impacts on the resource; if adverse impacts appear, the activity will be moved to secondary locations or curtailed entirely. Specific conditions may apply depending upon the requested activity and will be addressed through the special use permit.

Law enforcement patrol of public use areas should minimize the above-mentioned types of violations. The current "Refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Natural history activities generally support refuge purposes and impacts can largely be minimized. The minor resource impacts attributed to these activities are generally outweighed by the benefits gained by educating present and future generations about refuge resources. Natural history activities are a public use management tool used to develop a resource protection ethic within society. This tool allows us to educate Refuge visitors about endangered and threatened species management, wildlife management and ecological principles and communities. A secondary benefit of natural history activities is that it instills an 'ownership' or 'stewardship' ethic in visitors and most likely reduces vandalism, littering and poaching; it also strengthens Service visibility in the local community. Environmental education through natural history activities is listed in the Refuge Manual (U.S. Fish and Wildlife Service, 1985) as the highest priority visitor activity throughout the National Wildlife Refuge System.

These activities will not materially interfere with or detract from the mission of the National

Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 10-year Reevaluation Date: December 27, 2014

Compatibility Determination

Use: Non-motorized Boating

Refuge Name: Great Meadows National Wildlife Refuge

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3, 1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for — incidental fish and wildlife-oriented recreational development,"
- (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

(a) What is the use? Is the use a priority public use?
Non-motorized boating consists of the use of canoes, kayaks, row boats or other human powered watercraft across open water. The use is not a priority public use, but would facilitate participation in a variety of priority wildlife-dependent activities, including fishing, hunting, wildlife observation and wildlife photography.

(b) Where would the use be conducted?
Non-motorized boating would be conducted only on the Sudbury and Concord rivers, not in refuge wetland pools or other ponds.

(c) When would the use be conducted?
Non-motorized boating would occur during times when the refuge is open.

(d) How would the use be conducted?
Access to the refuge is at specific points on and off the refuge.

(e) Why is this use being proposed?
Non-motorized boating will facilitate participation in priority wildlife-dependent recreation.

Availability of Resources: The costs of infrastructure associated with facilitating non-motorized boating are discussed in the compatibility determinations for the respective wildlife dependent public uses. These costs are also included in Appendix E of the Comprehensive Conservation Plan (CCP) for Great Meadows NWR. Existing facilities at Great Meadows NWR would be used. Minor improvements and maintenance would be accomplished by refuge staff and volunteers

Anticipated Impacts on Refuge Purpose: Non-motorized boating at Great Meadows NWR will be monitored to ensure the activity will not have adverse impact on wildlife habitat, or the management of migratory birds and other wildlife species. This activity will facilitate wildlife-dependent recreation.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility: Boaters will utilize only established trails and other areas open to the public and not venture into closed areas. The current "refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Non-motorized boating is to be used only as a means to facilitate the priority public uses identified above.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: _____/s/ Elizabeth A. Herland 12/21/2004__
(Signature and Date)

Concurrence - Regional Chief: _____/s/ Anthony D. Léger 12/27/2004____
(Signature and Date)

Mandatory 10-year Re-evaluation Date: ____December 27, 2014___

Compatibility Determination

Use: Scientific Research

Refuge Name: Great Meadows National Wildlife Refuges

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3, 1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

(a) What is the use? Is the use a priority public use?
The use is research conducted by non-Service personnel. The purposes of research conducted on the refuge are to further the understanding of the natural resources and to improve the management of such resources on the refuge or within the National Wildlife Refuge System (Refuge System). Priority will be given to research which is applicable to wildlife, habitat, or public use management on and near the refuge. Research conducted by non-Service personnel is not a priority public use of the Refuge System.

(b) Where would the use be conducted?
The location of the research will vary depending on the individual research project that is being conducted. The entire refuge may be made available for specific scientific research projects. However, an individual research project is usually limited to a particular habitat type, plant or wildlife species. On occasion research projects may encompass an assemblage of habitat types, plants or wildlife. The research location will be limited to only those areas of the refuge that are necessary to conduct any specific, approved research project.

(c) When would the use be conducted?
The timing of the research will depend on the individual research project that is being conducted. Scientific research may be allowed to occur on the refuge throughout the year. An individual research project could be short-term in design, requiring one or two visits over the course of a few days. Other research projects could be multiple-year studies that require daily visits to the study site. The timing of each individual research project will be limited to the minimum required to complete the project. If a research project occurs during a refuge hunting season, special

precautions or limitations may be required to ensure the safety of researchers or staff.

(d) How would the use be conducted?
The methods of a research project will depend on the individual project that is being conducted. The methods of each research project will be evaluated before it will be allowed to occur on the refuge. No research project will be allowed to occur if it does not have a study plan approved by the refuge manager, or if the refuge manager determines the project may adversely affect wildlife, wildlife habitat, on-going or planned refuge management activities, previously approved research programs, approved priority public uses, or public health and safety.

(e) Why is this use being proposed?
Research by non-Service personnel is conducted by colleges, universities, Federal, State, and local agencies, non-governmental organizations, and qualified members of the general public. The purposes of research conducted on the refuge are to further the understanding of the natural resources and to improve the management of such resources on the refuge or within the National Wildlife Refuge System. Priority will be given to research which is applicable to wildlife, habitat, or public use management on and near the refuge.

Most research projects on the refuges comprising the Eastern Massachusetts NWR Complex examine management of avian resources, various public uses, and rare, threatened or endangered species. Currently, research by non-Refuge staff is concentrated on 5 of the Refuges in Eastern Massachusetts NWR Complex: Great Meadows, Assabet River, Oxbow, Monomoy, and Massasoit. Much of the research is focused on management of migratory birds, or resident herptiles and mammals, but other more specific research projects have also been implemented. In addition, much of the research conducted at the Refuges is part of larger, landscape based projects. At Great Meadows NWR, Special Use Permits have been issued for research which has included: investigating deer populations and movements, particularly in the winter months; investigating Blanding's turtle populations, movements, and habitat occupancy during the non-nesting season; mapping the spread of West Nile Virus; and evaluating mercury contamination in the Sudbury and Concord Rivers. At Assabet River and Oxbow NWRs, research activities have included establishing presence, documenting habitat use, and monitoring impacts to productivity of Blanding's Turtles, Spotted Turtles, Box Turtles, and Wood Turtles. At Monomoy NWR, research has covered the breadth of biological resources including: neurological studies involving horseshoe crabs; movement patterns and use of the Refuge by grey and harbor seals; and tern phenology, behavior, and productivity on Monomoy (a control site for oil spill studies occurring in Buzzards Bay). At Massasoit NWR, research has focused on the natural history of the federally listed Northern red-bellied cooter. Although no Special Use Permits have been issued to date for biological research on Nomans Land Island, Mashpee, and Nantucket NWRs, it is likely that research will occur on these sites in the future.

The Service will encourage and support research and management studies on refuge lands that improve and strengthen natural resource management decisions. The refuge manager will encourage and seek research relative to approved refuge objectives that clearly improves land management and promotes adaptive management. Information that enables better management of the Nation’s biological resources and is generally considered important to agencies of the Department of Interior, including the U.S. Fish and Wildlife Service; the Refuge System; and State Fish and Game Agencies, and that addresses important management issues or demonstrate techniques for management of species and/or habitats will be the priority.

The refuge may also consider research for other purposes which may not be directly related to refuge-specific objectives, but would contribute to the broader enhancement, protection, use, preservation and management of populations of fish, wildlife and plants, and their natural diversity within the region or flyway. These proposals must comply with the Service's compatibility policy.

The refuge may develop a list of research needs that will be provided to prospective researchers or organizations upon request. Refuge support of research directly related to refuge objectives may take the form of funding, in-kind services such as housing or use of other facilities, direct staff assistance with the project in the form of data collection, provision of historical records, conducting of management treatments, or other assistance as appropriate.

Availability of Resources: The bulk of the cost for research is incurred in staff time to review research proposals, coordinate with researchers, write Special Use Permits, and review the research results. In some cases, a research project may only require one day of staff time to write a Special Use Permit. In other cases, a research project may require weeks of staff time. Currently, a senior refuge biologist spends an average of seven weeks a year working full time on research projects conducted by outside researchers. At an hourly wage of approximately $30 (for a GS-12), this adds up to about $8,500 annually for resources spent on outside research.

Anticipated Impacts of the Use: Disturbance to wildlife and vegetation by researchers could occur through observation, a variety of wildlife capture techniques, banding, and accessing the study area by foot or vehicle. It is possible that direct or indirect mortality could result as a by-product of research activities. Mist-netting or other wildlife capture techniques, for example, can cause mortality directly through the capture method or in-trap predation, and indirectly through capture injury or stress caused to the organism.
Overall, however, allowing well designed and properly reviewed research to be conducted by non-Service personnel is likely to have very little impact on refuge wildlife populations. If the research project is conducted with professionalism and integrity, potential adverse impacts are likely to be outweighed by the knowledge gained about an entire species, habitat or public use.

Public Review and Comment: This compatibility determination has been made available for public review by posting on the refuge bulletin board for a period of thirty days, including information about the release of the compatibility determination in a planning update that was sent to all of the individuals on the comprehensive conservation plan mailing list, and posted on the refuge website. The comment period was from June 21, 2004 to July 20, 2004.

Determination (check one below):

___ Use is Not Compatible

_X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility: All researchers will be required to submit a detailed research proposal following Service Policy (FWS Refuge Manual Chapter 4 Section 6, as may be amended). The refuge must be given at least 45 days to review proposals before initiation

of research. If collection of wildlife is involved, the refuge must be given 60 days to review the proposal. Proposals will be prioritized and approved based on need, benefit, compatibility, and funding required.

Special Use Permits (SUP) will be issued for all research conducted by non-Service personnel. The SUP will list the conditions that the refuge manager determines to be necessary to ensure compatibility. The Special Use Permits will also identify a schedule for progress reports and the submittal of a final report or scientific paper.

Regional refuge biologists, other Service Divisions, State agencies or non-governmental organizations and biologists may be asked to provide additional review and comment on any research proposal.

All researchers will be required to obtain appropriate State and Federal permits.

All research related Special Use Permits will contain a statement regarding the Service's policy regarding disposition of biotic specimen. The current Service policy language in this regard (USFWS, 1999) is, "*You may use specimens collected under this permit, any components of any specimens (including natural organisms, enzymes, genetic material or seeds), and research results derived from collected specimens for scientific or educational purposes only, and not for commercial purposes unless you have entered into a Cooperative Research and Development Agreement (CRADA) with us. We prohibit the sale of collected research specimens or other transfers to third parties. Breach of any of the terms of this permit will be grounds for revocation of this permit and denial of future permits. Furthermore, if you sell or otherwise transfer collected specimens, any components thereof, or any products or any research results developed from such specimens or their components without a CRADA, you will pay us a royalty rate of 20 percent of gross revenue from such sales. In addition to such royalty, we may seek other damages and injunctive relief against you.*"

Any research project may be terminated at any time for non-compliance with the SUP conditions, or modified, redesigned, relocated or terminated, upon a determination by the refuge manager that the project is causing unanticipated adverse impacts to wildlife, wildlife habitat, approved priority public uses, or other refuge management activities.

Justification: The Service encourages approved research to further understanding of refuge natural resources. Research by non- Service personnel adds greatly to the information base for refuge managers to make proper decisions. Research conducted by non-Service personnel will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 10-year Re-evaluation Date: December 27, 2014

Literature Cited:

U.S. Fish and Wildlife Service. 1985. Refuge Manual. Washington, D.C.: U.S. Government Printing Office.

U.S. Fish and Wildlife Service. 1999. Director's Order No. 109: Use of Specimens Collected on Fish and Wildlife Lands. March 30, 1999.

Compatibility Determination

Use: Snowshoeing and Cross-country Skiing

Refuge Name: Great Meadows National Wildlife Refuges

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3, 1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species.." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Proposed Use: This use would facilitate wildlife observation, wildlife photography, and interpretive programs during winter months. The trail systems are not plowed because of the cost and because of the habitat disturbance plowing would entail. The use simply involves foot-travel over the surface of the snow with the use of snowshoes and cross country skis on the refuge trail systems. Maps showing the trails are included in the refuge brochures for Great Meadows NWR.

Availability of Resources: The cost of trail and facilities maintenance are not directly related to showshoeing or cross country skiing. Costs for activities that are facilitated by these methods of locomotion are discussed under their respective compatibility determinations.

Anticipated Impacts on Refuge Purpose: Snowshoeing and cross country skiing will have no adverse impact on the management of migratory birds or other wildlife species. These activities will only be done in coordination with wildlife-dependent recreation. These will likely create similar disturbances as people walking on the trails.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility: Snowshoers and cross country skiers will utilize only established trails and other areas open to the public and not venture into closed areas. The current "refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges: environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

Snowshoeing and cross country skiing are to be used only as a means to facilitate the priority public uses identified above.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 10-year Reevaluation Date: December 27, 2014

Compatibility Determination

Use: Wildlife Observation and Photography

Refuge Names: Great Meadows National Wildlife Refuge

Establishing Authority: Great Meadows National Wildlife Refuge (NWR) was established May 3,1944 under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) and Refuge Recreation Act (16 U.S.C. § 460k-1).

Refuge Purposes: Great Meadows purposes:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d),
- "... suitable for -- incidental fish and wildlife-oriented recreational development," (16 U.S.C. § 460k-1),
- "the protection of natural resources," (16 U.S.C. § 460k-1),
- "and the conservation of threatened or endangered species..." (16 U.S.C. § 460k-1)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Great Meadows NWR offers trails, an observation platform, and wildlife observation and photography opportunities. Access to the Refuge for this activity is achieved through walking, snowshoeing or cross-country skiing. Wildlife observation and photography include walking on open and established trails to observe and/or photograph the natural environment.

A parking area at Heard Pond will be created, in addition we will be creating photo blinds at three sites within the refuge, increasing directional signage to all public use areas, and creating habitat demonstration areas to explain management and observe wildlife.

Availability of Resources: Wildlife observation and photography occur through the use of existing staff, resources, and facilities. Existing resources for wildlife observation include trails and an observation platform. The amount and character of these opportunities will be a direct reflection of the refuge's staff and funding levels. The following components of a wildlife observation and photography program will need to be developed to fully implement the program outlined in the Comprehensive Conservation Plan. Additional components may be developed at a later date. Specific costs will be determined as implementation of the program occurs. Some of these projects are either underway or have been completed. Projects completed in part or in whole by volunteers require less fiscal resources.

- Improve public use infrastructure including: trails system, construction of observation platforms and photo blinds
- Provide accessible wildlife dependent recreation opportunities & interpretation

Anticipated Impacts on Refuge Purpose: We predict that the impacts of wildlife observation and photography uses will be minimal. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism and entrance into closed areas. We will not be creating new trails, rather improving existing trails. There will be some removal of vegetation to place the observation platforms and photo blinds. In the event of persistent disturbance to habitat or wildlife the activity will be restricted or discontinued. Little energy will be expended by wildlife leaving areas of disturbance.

Public Review and Comment: The compatibility determination was included in the Draft CCP/EA. The Draft CCP/EA was available for comment from July 20 through September 3, 2003. Refuge staff held four public meetings to collect public comments, written and verbal, on the draft CCP/EA, including all compatibility determinations.

Determination:
Use is not compatible ___.
Use is Compatible with the following stipulations _X_.

The following stipulations are required to ensure compatibility:
Law enforcement patrol of public use areas should minimize the above-mentioned types of violations. The current "Refuge open ½ hour before sunrise to ½ hour after sunset" regulation restricts entry after daylight hours, and should be maintained along with "Public Use Restricted to Trails Only".

Special use permits are required for organizations conducting wildlife observation and photography activities on the refuge. A fee may be charged for the special use permit. The areas used by such tours will be closely monitored to evaluate the impacts on the resource; if adverse impacts appear, the activity will be moved to secondary locations or curtailed entirely. Specific conditions may apply depending upon the requested activity and will be addressed through the special use permit.

Commercial photography is subject to a special use permit and commercial photographers will be charged a fee. The fee is dependent on size, scope and impact of the proposed activitiy.

Periodic evaluations will be done on trails to assess visitor impacts on the habitat. If evidence of unacceptable adverse impacts appear, these uses will be curtailed, relocated or discontinued. Refuge regulations will be posted and enforced. Closed areas will be established, posted and enforced. The known presence of any threatened or endangered species likely to be disturbed by trail activity will preclude use of that site as a trail.

All photographers must follow refuge regulations. Photographers in closed areas must follow the conditions outlined in the special use permit which normally include notification of refuge personnel each time any activities occur in closed areas. Use of a closed area should be restricted to inside blinds to reduce disturbance to wildlife. No baits or scents may be used. At the end of each session, the blind must be removed. All litter will be removed daily.

Justification: The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; wildlife observation and wildlife photography, environmental education, interpretation, hunting, and fishing. These priority public

uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management.

The majority of visitors to the refuge are there to view the wildlife and upland, wetland, and grassland habitat areas. Some visit to develop an understanding of natural or cultural history. This visitation is in accordance with a wildlife-oriented activity and is an acceptable secondary use. There will be some visitor impacts from this activity, such as trampling vegetation (Kuss and Hall, 1991) and disturbance to wildlife near trails (Klein, 1989 and Burger, 1981), but the knowledge, appreciation and understanding of management gained by visitors will provide support for the Service. The long-term benefits gained through wildlife observation and photography activities outweigh the impacts listed above.

These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

Signature - Refuge Manager: /s/ Elizabeth A. Herland 12/21/2004
(Signature and Date)

Concurrence - Regional Chief: /s/ Anthony D. Léger 12/27/2004
(Signature and Date)

Mandatory 15-year Reevaluation Date: December 27, 2019